UNIV.OF
TORONTO
LIBRARY

THE
SURGICAL CLINICS
OF
CHICAGO

VOLUME 4^{1}, 1920
WITH 398 ILLUSTRATIONS

344224
11.12.37

PHILADELPHIA AND LONDON
W. B. SAUNDERS COMPANY

COPYRIGHT, 1920, BY W. B. SAUNDERS COMPANY. ALL RIGHTS RESERVED
PUBLISHED BI-MONTHLY (SIX NUMBERS A YEAR) BY W. B. SAUNDERS COMPANY, WEST WASHINGTON SQUARE, PHILADELPHIA

PRINTED IN AMERICA

RD
1
S85
v.4
no.1-3

3

CONTRIBUTORS TO VOLUME 4

E. WYLLYS ANDREWS, M. D., Professor of Surgery, Northwestern University Medical School; Surgeon in Chief, Cook County Hospital, Chicago; Attending Surgeon, Michael Reese Hospital, Chicago.

EDMUND ANDREWS, M. D., Instructor in Surgery, Northwestern University Medical School.

CARL BECK, M. D., Surgeon, North Chicago Hospital.

ARTHUR DEAN BEVAN, M. D., Professor of Surgery, Rush Medical College, in Affiliation with the University of Chicago; Surgeon to the Presbyterian Hospital, Chicago.

EDWARD LYMAN CORNELL, M. D., Attending Obstetrician, Chicago Lying-In Hospital and Dispensary; Attending Obstetrician, Provident Hospital; Associate in Obstetrics, Northwestern University Medical School.

CAREY CULBERTSON, M. D., Assistant Professor of Gynecology and Obstetrics, Rush Medical College, Chicago; Assistant Attending Gynecologist and Obstetrician, Presbyterian Hospital, Chicago; Attending Gynecologist, Cook County Hospital, Chicago.

HARRY CULVER, M. D., Cystoscopist to the Cook County Hospital, Chicago; Instructor in Urology, University of Illinois.

VERNON C. DAVID, M. D., Instructor in Surgery, Rush Medical College, Chicago.

BENJAMIN FRANKLIN DAVIS, M. D., Assistant Attending Surgeon, Presbyterian Hospital, Chicago; Instructor in Surgery, Rush Medical College, Chicago.

CARL BRADEN DAVIS, M. D., Presbyterian Hospital, Chicago.

FREDERICK G. DYAS, M. D., Assistant Professor of Surgery, College of Medicine, University of Illinois; Attending Surgeon, Cook County Hospital, Chicago.

DANIEL N. EISENDRATH, M. D., Clinical Professor of Surgery, Rush Medical College, Chicago; Attending Surgeon, Michael Reese and Cook County Hospitals, Chicago.

J. S. EISENSTAEDT, M. D., Associate Genito-urinary Surgeon, Michael Reese Hospital, Chicago.

FREDERICK HOWARD FALLS, M. D., Cook County Hospital.

DR. GATEWOOD, Instructor in Surgery, Rush Medical College, Chicago.

LEE C. GATEWOOD, M. D., Associate in Medicine, Rush Medical College, Chicago.

GEORGE D. J. GRIFFIN, M. D., Professor of Surgery, Loyola University School of Medicine.

GEORGE W. HALL, M. D., Associate Professor of Medicine (Nervous and Mental Diseases), Rush Medical College, Chicago.

ROBERT H. HERBST, M. D., Attending Urologist to Presbyterian Hospital; Assistant Professor of Genito-urinary Surgery, Rush Medical College, Chicago.

ALLEN B. KANAVEL, M. D., Assistant Professor of Surgery, Northwestern University Medical School; Attending Surgeon, Wesley Memorial and Cook County Hospitals, Chicago.

GUSTAV KOLISCHER, M. D., Attending Surgeon to the Genito-Urinary and Radio-Therapeutic Departments, Michael Reese Hospital, Chicago.

HERMAN L. KRETSCHMER, M. D., Urologist, Presbyterian Hospital; Assistant in Genito-urinary Surgery, Rush Medical College, Chicago.

PHILIP H. KREUSCHER, M. D., Attending Surgeon, Mercy Hospital, Chicago.

HUGH N. MacKECHNIE, M. D., Professor of Surgery, Loyola University Medical School; Associate Professor of Surgery, Post-graduate Medical School; Surgeon to Frances Willard Hospital.

LEWIS L. McARTHUR, M. D., Senior Attending Surgeon, St. Luke's and Michael Reese Hospitals, Chicago.

CHARLES MORGAN McKENNA, M. D., Assistant Professor of Genito-urinary Surgery, College of Medicine, University of Illinois.

HUGH McKENNA, M. D., Senior Surgeon and President of Staff, St. Joseph's Hospital, Chicago; Associate Professor of Surgery (Extramural), Rush Medical College, Chicago.

GOLDER L. McWHORTER, M. D., Instructor in Surgery, Rush Medical College, Chicago.

CHARLES LOUIS MIX, M. D., Professor of Clinical Medicine, Northwestern University Medical School; Attending Physician, Mercy Hospital, Chicago.

ALBERT H. MONTGOMERY, M. D., Instructor in Surgery, Rush Medical College, Chicago; Junior Attending Surgeon to the Presbyterian Hospital, Chicago.

ROY L. MOODIE, Ph. D., Associate Professor of Anatomy, University of Illinois, Chicago.

EDWARD LOUIS MOORHEAD, M. D., Professor and Head of the Department of Surgery, Loyola University School of Medicine; Chief of Staff and Senior Surgeon, Mercy Hospital; Consulting Surgeon, Oak Park Hospital.

ALBERT J. OCHSNER, M. D., LL. D., Surgeon in Chief, Augustana and St. Mary's Hospitals, Chicago; Professor of Clinical Surgery in the Medical Department of the State University of Illinois.

CHARLES AUBREY PARKER, M. D., Attending Orthopedic Surgeon, Cook County Hospital; Assistant Attending Surgeon (Orthopedic), Presbyterian Hospital, Chicago; Assistant Surgeon (Orthopedic), Rush Medical College, Chicago.

D. B. PHEMISTER, M. D., Associate Attending Surgeon, Presbyterian Hospital, Chicago.

GEORGE E. SHAMBAUGH, M. D., Professor of Otology and Laryngology, Rush Medical College, Chicago; Otologist to the Presbyterian Hospital, Chicago.

KELLOGG SPEED, M. D., Assistant Professor of Surgery, Rush Medical College, Chicago; Assistant Attending Surgeon, Presbyterian Hospital; Attending Surgeon, Cook County and Provident Hospitals, Chicago.

DAVID C. STRAUS, M. D., Assistant in Surgery, Rush Medical College; Associate Attending Surgeon, Michael Reese Hospital, Chicago.

ALFRED A. STRAUSS, M. D., Michael Reese Hospital.

RICHARD J. TIVNEN, M. D., Instructor in Ophthalmology, Northwestern University Medical School.

THOMAS J. WATKINS, M. D., Professor of Gynecology, Northwestern University Medica School; Gynecologist, St. Luke's Hospital, Chicago.

LEIGH F. WATSON, M. D., Associate in Surgery, Rush Medical College.

CONTENTS OF VOLUME 4

Clinic of Dr. Edmund Andrews, *Mercy Hospital* PAGE

Large Strangulated Umbilical Hernia ... 1247

Clinic of Dr. E. Wyllys Andrews, *Mercy and St. Luke's Hospitals*

Chronic Cholecystitis and Cholelithiasis with Positive x-Ray Diagnosis ... 37
Two Cases of Myeloma ... 43

Clinic of Drs. E. Wyllys and Edmund Andrews and Dr. Charles Louis Mix, *St. Luke's Hospital*

"Dumping Stomach" and Other Results of Gastrojejunostomy: Operative Cure by Disconnecting Old Stoma ... 879

Clinic of Dr. Carl Beck, *North Chicago Hospital*

Ectropion of the Lower Lid ... 107
Plastic on the Heel ... 109
Ununited Fracture of Tibia and Fibula: Repair by Open Operation and Wiring of Fragments ... 115
Suture of Nerves and Tendons of the Wrist ... 983
Tuberculosis of Appendix and Both Adnexæ ... 1263
Arteritis Obliterans ... 1267
Tuberculous Arthritis of the Knee-joint: Ankylosis in a Faulty Position; Knee-joint Resection ... 1271

Clinic of Dr. Arthur Dean Bevan, *Presbyterian Hospital*

Branchial Cyst ... 1
Intestinal Obstruction ... 9
Appendical Abscess Simulating Carcinoma of the Ascending Colon ... 17
Imperforate Anus ... 21
Gauze Sponge Left in Gall-bladder—Removal After Interval of Eleven Years ... 31
Carcinoma of the Stomach—Anterior Gastro-enterostomy ... 305
Carcinoma of the Splenic Flexure ... 311
Imperforate Anus ... 321
Fracture of the Malar Bone ... 329
Musculospiral Paralysis: Treatment by Tendon Transplantation and Nerve Suture ... 333
Repair of the Common Bile-duct ... 519
Paraffinoma of Nose and Left Eyelid ... 529
Splenectomy ... 759
Pilonidal Cyst ... 765
x-Ray Burn of the Anus ... 771
Postoperative Ventral Hernia ... 775
Demonstration of Three Abdominal Cases ... 783
Dislocation of Patellæ ... 929
Exstrophy of the Bladder ... 1103
Abscess in the Deep Cervical Fascia of the Neck ... 1111
Hypernephroma ... 1115
Stone in the Cystic Duct ... 1123
Stone in the Kidney: Removal by Pyelotomy ... 1131

Clinic of Drs. Arthur Dean Bevan and L. C. Gatewood, *Presbyterian Hospital*

Mesenteric Fibroma ... 919

Clinic of Dr. Edward Lyman Cornell, *Provident Hospital*

Krönig Cesarean Section ... 195
Ectopic Pregnancy ... 431
Ovarian Cyst Simulating Ectopic Gestation ... 441
Occipitoposterior Position at Term ... 551
Occipitoposterior Position Complicated by Lobar Pneumonia and Fractured Rib 563
Cesarean Section for Placenta Prævia ... 1081

Clinic of Dr. Carey Culbertson, *Presbyterian and Cook County Hospitals*

Ligament Shortening in the Treatment of Retroflexion of the Uterus ... 179
The Management of General Pelvic Peritonitis ... 675
Fibroid of the Uterus ... 1211

PAGE

Clinic of Dr. Harry Culver, *Cook County Hospital*
- Papilloma of the Posterior Urethra.......... 1307
- Benign Epithelial Tumors of the Ureter.......... 1311

Clinic of Dr. Vernon C. David, *Presbyterian Hospital*
- Treatment of Acute Suppurative Arthritis of the Knee-joint.......... 1253

Clinic of Dr. Benjamin F. Davis, *Presbyterian Hospital*
- Traumatic Separation of the Upper Femoral Epiphysis.......... 143

Clinic of Dr. Carl B. Davis, *Presbyterian Hospital*
- Lymphosarcoma of the Spine.......... 119
- Extradural Fibroma of the Spine.......... 123
- Ulnar Paralysis.......... 127
- Cervical Rib.......... 269

Clinic of Dr. Frederick G. Dyas, *Cook County Hospital*
- Umbilical Hernia in a Baby Eight Hours Old.......... 449
- Intestinal Obstruction.......... 453
- Compound Fracture of Femur in a Child.......... 1023
- Cholelithiasis with Biliary Fistula Discharging at the Umbilicus.......... 1027
- Tetanus Following a Contused and Lacerated Wound of Leg: Recovery.......... 1031

Clinic of Dr. Daniel N. Eisendrath, *Michael Reese and Cook County Hospitals*
- The Inguinal Route in Femoral Herniotomy.......... 49
- The Diagnosis of Tuberculosis of the Kidney and the Technic of Nephrectomy 401
- Tuberculosis of a Hernial Sac with a Brief Consideration of Abdominal Tuberculosis in General.......... 569
- The Anatomic Varieties of Prostatic Hypertrophy.......... 663
- Infections of the Kidney.......... 1003
- Pyelitis of Pregnancy and the Puerperium—A Clinical Lecture.......... 1225

Clinic of Dr. Frederick Howard Falls, *Cook County Hospital*
- Ruptured Interstitial Ectopic Pregnancy.......... 655

Clinic of Dr. Gatewood, *Presbyterian Hospital*
- Stricture of the Esophagus.......... 69
- Dislocation of the Hip with Fracture of the Acetabulum.......... 77
- Strangulated Ovarian Cyst.......... 425
- Tuberculous Glands of the Neck.......... 609
- Papillary Cystadenoma of the Breast in a Child.......... 795
- Acute Pancreatitis.......... 801
- Tuberculosis of the Appendix.......... 809
- Acute Diverticulitis of the Sigmoid.......... 1183

Clinic of Dr. George D. J. Griffin, *Mercy Hospital*
- Empyema: A Brief Résumé of Treatment.......... 135

Clinic of Dr. Robert H. Herbst, *Presbyterian Hospital*
- An Unusually Large Prostate Gland.......... 863
- Ulcer of the Bladder.......... 867

Clinic of Dr. Allen B. Kanavel, *Wesley Memorial Hospital*
- Empyema.......... 457
- Tumors of the Face.......... 731
- Hematuria.......... 1035
- The After-treatment of Infections of the Hand.......... 1165

Clinic of Drs. Gustav Kollischer and J. S. Eisenstaedt, *Michael Reese Hospital*
- Papilloma of the Bladder.......... 833
- Muscle-splitting Incision for Exposure of Kidney.......... 839

Clinic of Dr. Herman L. Kretschmer, *Presbyterian, Alexian Brothers, and St. Joseph's Hospitals*
- Carcinoma of the Bladder.......... 243
- Cystic Dilatation of Intravesical Portion of Ureter Due to Presence of a Calculus.......... 483
- Metastatic Prostatic Abscess.......... 489
- Elusive Ulcer of the Bladder.......... 1241

Clinic of Dr. Philip H. Kreuscher, *Mercy Hospital*
- Carcinoma of the Esophagus: Gastrostomy.......... 83

Clinic of Dr. Hugh N. MacKechnie, *Frances Willard Hospital* PAGE

Silent Appendical Abscesses in Children 297
Foreign Body Impacted at Ileocecal Junction 301

Clinic of Dr. Lewis L. McArthur, *St. Luke's Hospital*

Sarcoma of the Posterior Tibial Nerve: Excision; Removal of Metastatic Foci in Retroperitoneal Lymph-glands Three Months Later 131

Clinic of Dr. Charles Morgan McKenna, *University of Illinois, Department of Genito-urinary Surgery*

Cysts of the Epididymis and Vas 161
Hydrocele and Amputation of the Scrotum 165
Sarcoma of the Bladder 171
Stone in the Ureter 1275
Tumor of Posterior Urethra: Removal by Fulguration 1283

Clinic of Dr. Hugh McKenna, *St. Joseph's Hospital*

Arthroplasty on the Hip 749
Neuroma of External Popliteal Nerve; Resection; End-to-end Anastomosis 753
Spina Bifida—Closure of Defect by Flap of Cartilage and Bone 1259

Clinic of Drs. Hugh McKenna and George W. Hall, *St. Joseph's Hospital*

Extramedullary Spinal Tumor 755

Clinic of Dr. Golder L. McWhorter, *Presbyterian Hospital*

Circumcision: Technic of Locale Anesthesia 151
Arthrotomy of the Knee-joint Under Local Anesthesia for Removal of the Medial Meniscus 155
Perineal Ectopia Testis 339
Chondroma of the Thumb 629
Advantage of the Elevated Doubl Inclined Plane in the Treatment of a Fracture of the Lower Third of the Femur 721
Salpingitis with Lateral Lumbovertebral Pain 937
Birth Fracture of the Humerus Reset with the Aid of the Fluoroscope 1155

Clinic of Dr. Albert H. Montgomery, *Presbyterian Hospital*

Two Cases of Muscle Injury 871
Bone Cysts 1287

Contribution by Dr. Roy L. Moodie, *Department of Anatomy, University of Illinois, College of Medicine*

Studies in Paleopathology: The Diseases of the Ancient Peruvians, and Some Account of Their Surgical Practices 211
Primitive Surgery in Ancient Egypt 349
The Antiquity of Pott's Disease and Other Spinal Lesions; Primitive Treatment 619
The Use of the Cautery Among Neolithic and Later Primitive Peoples 851
Surgery and Disease Among the Pre-Columbian Indians of North America 1091
The Amputation of Fingers Among Ancient and Modern Primitive Peoples and Other Voluntary Mutilations Indicating Some Knowledge of Surgery 1299

Clinic of Dr. Edward Louis Moorhead, *Mercy Hospital*

Rupture of Quadriceps Extensor Tendon: Operation; Result 255
Varicocele 259
Septic Gall-bladder with Spontaneous Cholecystenterostomy 265
Acute Appendicitis and Gall-stones 641
Two Cases of Acute Lymphangitis 647
Fractured Ribs, Emphysema, Posterior Dislocation of Right Hip-joint 813
Obstruction of the Sigmoid with a Palpable Abdominal Mass 821
Undescended Testicle: Inguinal Hernia 827
Chronic Ulcer of Leg Treated by Skin-grafting 1047
Multiple Tumors of the Thyroid 1051
Chronic Duodenal Ulcer: Slow Perforation with Formation of Extensive Adhesions to Gall-bladder, Liver, and Hepatic Flexure of Colon 1055

Clinic of Dr. Albert J. Ochsner, *Augustana Hospital*

Prostatectomy 233
Endothelioma of the Brain 711
Rupture of Gall-bladder into Duodenum 995
Carcinoma of the Pancreas 1205

Clinic of Dr. Charles A. Parker, *Cook County Hospital and Home for Destitute Crippled Children*

Congenital Dislocation of the Patella 359
Progressive Flexion Deformity of the Fingers of Muscular Origin—Diagnosis and Treatment 701
Treatment of Bow-legs and Knock-knees 705

Clinic of Dr. D. B. Phemister, *Presbyterian Hospital* PAGE
Ankylosis of the Jaw Following Rheumatism: Arthroplasty.................... 845

Clinic of Dr. George E. Shambaugh, *Presbyterian Hospital*
Malignant Tumor at the Upper End of the Esophagus.......................... 591
Encephalitis with Paralysis of Soft Palate and Esophagus.................... 593
Nasal Obstruction Simulating Persisting Head Colds.......................... 597
Asthma Cured by Operation in Nose.. 599
Persistent Mastoid Fistula After Simple Mastoid Exenteration............... 601
Acute Otitis Media in an Infant with Acute Swelling Back of the Ear....... 605
Deafness Improved by Using Artificial Ear-drums............................ 689
Congenital Deaf-mutism.. 693
Labyrinthine Deafness with Diplacusis....................................... 695
Labyrinthine Deafness with Some Unusual Features............................ 697
Bilateral Destruction of the Labyrinth as a Sequel of Chronic Suppurative Otitis Media.. 1063
Impairment of Hearing Due to Fracture at Base of Skull..................... 1069
Cerebral Nerve Deafness.. 1073
Aural Vertigo Due to Degeneration of Vestibular Nerve Without Involvement of Cochlea.. 1077
Acute Perichondritis of the Epiglottis..................................... 1191
Acute Sphenoid Sinuitis.. 1193
Primary Syphilitic Sore on the Faucial Tonsil.............................. 1197
Suppuration of the Labyrinth Followed by Intracranial Complications........ 1199
Chronic Suppurative Otitis Media with Cholesteatoma........................ 1203

Clinic of Dr. Kellogg Speed, *Cook County Hospital*
Prolapsus Recti.. 61
Inguinal Hernia.. 367
Burns.. 975
Tendon Transplantation for Wrist-drop...................................... 1139

Clinic of Dr. David C. Straus, *Michael Reese and Cook County Hospitals*
Subdiaphragmatic Abscess—Transpleural Drainage of a Case Due to Abscess of the Liver.. 377
Perforated Gastric Ulcer—Diagnosis, Surgical Management, Treatment by Actual Cautery.. 493
Perinephritic Abscess—Tuberculosis of Kidney—Subscapular Nephrectomy..... 893

Clinic of Dr. Alfred A. Strauss, *Michael Reese Hospital*
Congenital Pyloric Stenosis.. 93
Intussusception.. 535
Various Methods of Blood Transfusion as Most Applicable in Various Ages... 987

Clinic of Dr. Richard J. Tivnen, *Mercy Hospital*
Congenital Cataract Binocular Complicated by a Large Persistent Thymus Gland 943
Endothelioma of Orbit: Total Symblepharon; Restoration of Culdesacs; Transplanted Flap (Wolfe).. 959
Extradural Abscess: Otitis Media Purulenta Chronica; Operation; Recovery.... 965

Clinic of Dr. Thomas J. Watkins, *St. Luke's Hospital*
Postoperative Atonic Ileus... 1151

Clinic of Dr. Leigh F. Watson, *Rush Medical College*
Local Anesthesia for Inguinal Herniotomy................................... 287

Index to Volume 4... 1317

SURGICAL CLINICS OF CHICAGO

Volume 4 Number 1

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

BRANCHIAL CYST

Summary: Pathologic anatomy, diagnosis, and treatment of branchial cysts. Necessity of careful, thorough dissection. Occasional carcinomatous degeneration of branchial remnants.

THE patient I shall operate upon this morning is this young man of eighteen or twenty, who comes to the clinic with a tumor under the angle of his jaw which he first noticed about six months ago. You will see as you look at the patient that the integument covering the swelling is white and normal in appearance and that it does not seem to be involved in the process. There is no evidence of inflammation. As I examine it carefully by palpation I find that the mass fluctuates. It is, as you see, about as large as a good-sized lemon. It has been painless. Examination of the rest of the structures in the neck show no evidence of any enlarged lymphatic glands. There has been no history of any acute inflammatory process about the throat. We have, in fact, to deal with what appears to be a cyst in the neck, which has come on silently and without any known cause. From its location, which is, as you see, below the angle of the jaw and in front of the sternocleidomastoid, and from its history I am inclined to make a diagnosis of branchial cyst, not with absolute certainty, but with a fair degree of certainty. The exact character of the lesion will have to be determined at operation.

Under ether anesthesia I make an incision along the sternocleidomastoid over the center of the projecting tumor (Fig. 1, *a*). As I cut down through the skin, superficial fascia, and platysma I come to a dark colored cyst (Fig. 1, *b*). Care-

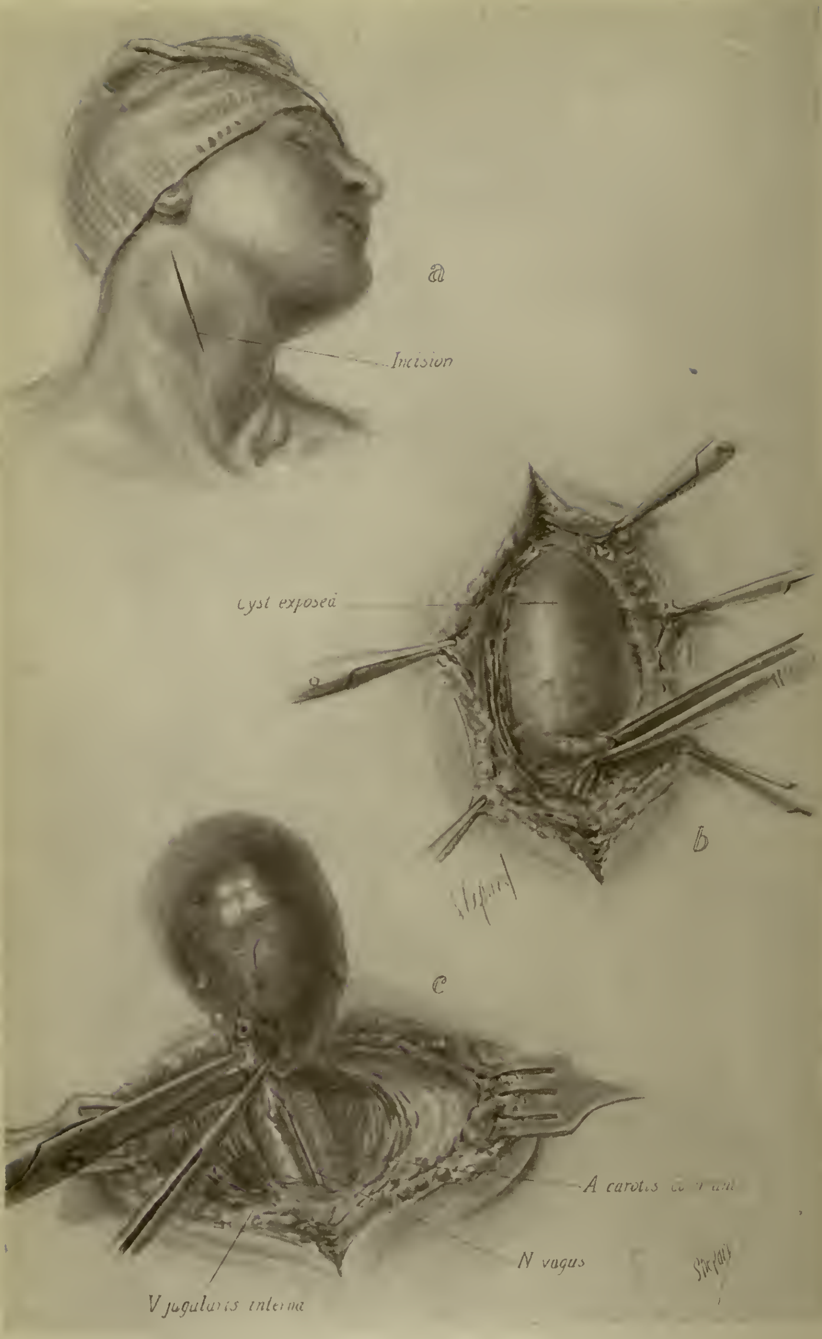
a
Incision
Cyst exposed
b
c
A carotis communis
N vagus
V jugularis interna

Fig. 1.

fully dissecting the overlying structures from the cyst wall, I fully expose the upper half of the cyst and bring it into view. As I do this you see that I expose the facial vein, which I can hold out of the way with a blunt retractor, so it will not be necessary for me to divide this in the dissection. As I continue the dissection I find that the posterior surface of the cyst wall is very closely adherent to the sheath of the great vessels of the neck, especially the internal jugular vein (Fig. 1, *c*). It now becomes quite clear that this cyst is not the result of a chronic inflammatory process such as a cold abscess resulting from tuberculosis, and I am more convinced that our clinical diagnosis is correct. Continuing my dissection, I have now separated the entire cyst except for a distance of about 1 inch in length and ½ inch in width, where it is very closely attached to the vessels, especially to the sheath over the internal jugular, and this fact also confirms the diagnosis of branchial cyst because it is well known that branchial cysts are in close relation to the great vessels of the neck at this point. I think I can by great patience and care dissect the cyst out entirely without injury to the jugular vein, and you see I have now been able to accomplish this. Some years ago when in this clinic Dr. Senn and Dr. Fenger were operating upon these cases they at one time felt that it was, as a rule, impossible to complete this dissection, and that they might have to leave a section of the cyst wall in contact with the internal jugular vein. Senn in several of these instances cauterized the surface of the cyst that was left in contact with the vein with the Paquelin cautery, believing that this was the best way of handling these cases. I have never been compelled to do this, and have always been able with patience and care to complete the dissection, and if I found a case in which I could not complete the dissection I think I would prefer to remove the section of the jugular vein which was in contact with the cyst wall rather than to follow the suggestion made by Senn, of leaving that section of the

---

Fig. 1.—*a*, Incision for approach to tumor; *b*, tumor exposed and dissection for the liberation of its posterior wall begun; *c*, extirpation nearing completion. Note intimate relation of tumor to internal jugular vein.

cyst wall and attempting to destroy the epithelium with the cautery.

These branchial cysts form one of the most interesting examples of the Cohnheim theory of the causation of tumors. They are due to embryonal arrests of the epithelium left from the branchial clefts in the tissues of the neck. It is interesting to note that these embryonal arrests seldom develop in the first few years of life. My own experience has been that somewhere from the tenth to the thirtieth year the embryonal arrests begin to grow and develop cystic tumors. The epithelium may be either squamous cell, columnar, or ciliated, depending upon whether it is from that portion of the branchial cleft that is near the ectoderm or from that portion which is near the pharynx. These cysts are filled with fluid such as you see in this case, a pea-soup fluid as a rule. Sometimes the fluid is very dark, possibly as a result of some hemorrhages that have occurred in the cyst, the fluid, of course, being produced by the lining epithelium.

Forty or fifty years ago these branchial cysts, as a rule, were not interfered with surgically, because it was felt at that time that the risk of removing them was very great on account of their close association with the great vessels of the neck, and radical extirpation was, therefore, as a rule, not undertaken. Sometimes, however, an attempt was made to palliate the condition by draining them and sometimes by injecting irritant fluids, with the hope that the lining epithelium might be destroyed. I can remember that one of my professors then on the faculty of Rush College had a branchial cyst which he was compelled to handle in a palliating way, and after I became a member of the faculty he called me in once or twice to take care of him. The cyst would grow to a certain size and become quite distressing from the appearance and from the pressure on the tissues of the floor of his mouth. He would then have the cyst evacuated and washed out with carbolic solution, and this would make him fairly comfortable for a number of months or weeks. Then the cyst would again fill up.

These branchial cysts are not to be confused with another form of cyst that develops here in the neck in the median line and not in the line of the sternocleidomastoid. The cyst that develops in the median line from embryonal remains is a cyst from the thyroglossal duct, this duct extending from the foramen cecum at the base of the tongue to the isthmus of the thyroid gland. Under ordinary normal conditions it disappears entirely except leaving a simple depression at the foramen cecum of the tongue, and the lower part becomes developed into the isthmus of the thyroid. Where the remains of the duct persist a cyst or fistula may be developed. My own experience in handling thyroglossal duct fistula has not been nearly as satisfactory as in handling branchial cysts. Where any operation is undertaken it must be radical, else it will result in failure, any remnant of the epithelium that is allowed to remain developing later either into a cyst or maintaining a fistula weeping more or less mucus and sometimes pus from the epithelial lined cavity. However, where a thorough radical operation is made a thyroglossal duct cyst can be, as a rule, completely extirpated and the patient cured.

As far as the differential diagnosis is concerned the only other lesions which I have mistaken for branchial cysts have been cysts in connection with remains of the submaxillary gland or normal submaxillary gland itself developing in the ordinary position of a branchial cyst. Usually the dissection at the time of operation and later the microscope enables one to make the necessary differential diagnosis.

There is an interesting and serious complication that develops in connection with these branchial cysts that you should be familiar with, and that is the development of a carcinoma from these epithelial remnants. I have had the misfortune to meet with a number of these cases and they are, as a rule, very confusing. I can recall one which we had a few years ago which was particularly interesting and an unusually difficult problem to solve.

A man of fifty was sent here by his attending medical man, who is also a very good surgeon, from a neighboring state. The man had developed a fluctuating tumor in his neck. This came on fairly rapidly, developing in the course of six or eight weeks,

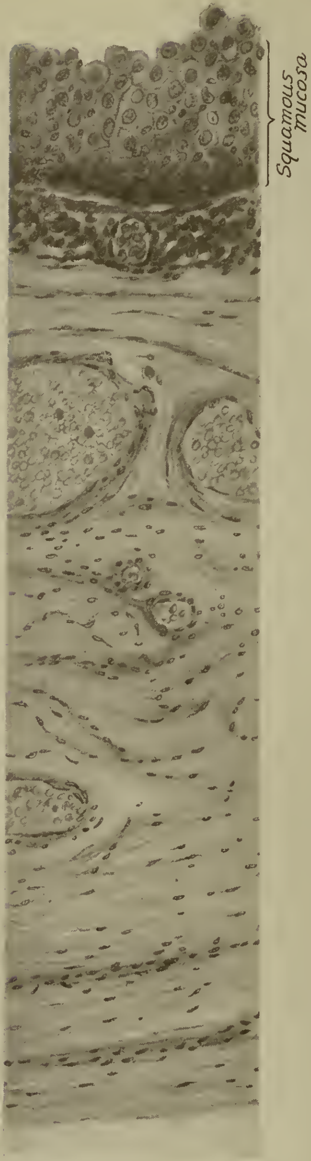

Fig. 2.—Microscopic section from wall of tumor showing the lining membrane of squamous epithelium.

and seemed to be a cold abscess. The surgeon operated upon it and found some pus and a large abscess cavity, wiped it out, and drained it. He thought the case would go on to recovery.

Instead of that, however, the wound refused to heal. A brawny induration developed in the neck without much if any evidence, however, of inflammation. He was then sent to my service. I operated upon him, and my first impression was that it was an inflamed branchial cyst. We made a careful dissection and removed the cyst wall, leaving behind some indurated tissue, which at first we believed was inflammatory. A careful microscopic section, however, showed that we had to deal with a branchial cyst which, however, had become also the site of a carcinoma. The process had become so wide-spread that it was impossible to remove all of it, so no further operative procedures were undertaken after the microscope had given us the definite diagnosis. The *x*-ray was used for a short time purely as a palliative means, but the patient succumbed to the disease within a few months.

One of our prominent surgical colleagues in New York was the victim of the same lesion, a carcinoma developing from a branchial remnant, the exact nature of which for a short time, at any rate, was not recognized. Where carcinoma develops from one of these branchial remnants in the neck the condition is sometimes associated with, first, the development of a cyst, and then the development of a carcinoma. Sometimes, on the other hand, without the development of any cyst a deep-seated primary carcinoma of the neck develops from this branchial remnant. The diagnosis, of course, in these cases is extremely difficult, because one looks in vain for the primary focus of the carcinoma about the mouth, tongue, or pharynx. We must keep in mind, however, when we find a carcinoma deeply situated in the neck, without any evidence of a primary focus elsewhere, the possibility of carcinoma developing from such branchial remnants.

After-history.—The patient went on to a very satisfactory recovery. The microscopic sections showed that the cyst wall was lined with squamous epithelium (Fig. 2).

INTESTINAL OBSTRUCTION

Summary: Operative management of obstruction of the large intestine. Value of the three-stage operation—necessity of primary colostomy.

The operation which I shall show you this morning will be the third, and I hope the final, operation which we have made upon this patient.

This patient is a woman of fifty who was brought to my service at the Presbyterian Hospital about two months ago with very marked intestinal obstruction. This condition had persisted for a number of days. In analyzing the facts it proved to be a case of obturation obstruction due to carcinoma of the colon. The woman had been under the care of Drs. Sippy and Brown, and they have been able to obtain some quite definite evidence from *x*-ray examination of the colon filled with barium. In the fluoroscopic screen and also on the plate which was taken there was a definite, typical, filling defect apparently about the center of the sigmoid loop. When I first saw her she was markedly distended, and anything in the way of a radical operation was out of the question.

I therefore advised and performed a right inguinal colostomy, bringing the cecum out through a muscle-splitting incision on the right side, suspending it with a bridge of silk, as we do in our colostomies, and relieving immediately the gas distention by introducing a No. 14 catheter into the sigmoid loop and holding it in place with two purse-string sutures, making a water-tight operation, so as to prevent contamination from the bowel (Fig. 3, *a*). We left the catheter in for two days, and then made a good-sized opening in the sigmoid, with the cautery at the point where we had introduced the catheter.

The patient recovered very rapidly from the obstructive symptoms, and at the end of three weeks was in condition to stand the radical operation of removing the carcinoma.

At the second operation I made a muscle-splitting incision on the left side, drew the sigmoid out, and found the carcinoma

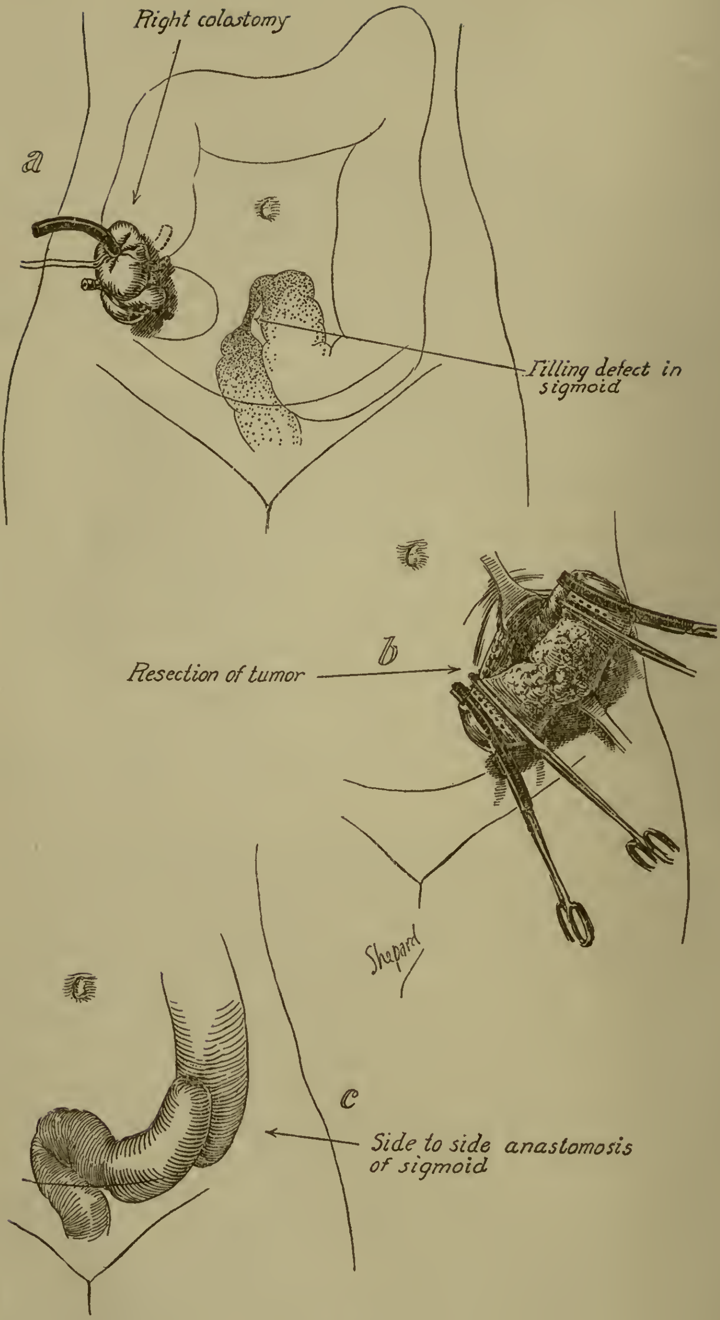
Right colostomy
a
Filling defect in sigmoid
b
Resection of tumor
Shepard
c
Side to side anastomosis of sigmoid

Fig. 3.

at about the center; I resected this widely, closed both ends, and made a side-to-side anastomosis. Fortunately, the carcinoma was situated at the center of the loop and had not as yet involved the mesenteric glands, so that this operation could be carried out satisfactorily (Fig. 3, *b*, *c*).

The patient made an unusually good recovery from the second operation, and we now have the third and final stage of this operation to undertake this morning, and that is the closure of the colostomy opening which was made at the first sitting.

We shall do this under local anesthesia as we have done in a number of cases. Infiltrating the area about the colostomy opening widely, I shall dissect out this loop of the cecum, close the opening, go in and replace the intestine inside of the peritoneal cavity, and make a complete closure of the muscle-splitting incision. You will notice that I dissect out the scar in the skin and the skin immediately around the colostomy opening in this dissection. In order to keep the field of operation as clean as possible I have packed the colostomy opening with iodoform gauze, and I have sterilized the field with tincture of iodin. I now come down to the external oblique. I very carefully dissect out the external oblique on both sides of the cecum. Holding the external oblique aside with four retractors, I now come to a rather surprising and unusual condition—a large loop of the cecum and ileum occupy a pocket between the external oblique and the internal oblique. This is an unusual finding. Usually in these cases the external oblique and transversalis are molded together so as to prevent the formation of hernias between these layers. You will notice that I shall have to use a large amount of local anesthetic in this case, a considerably larger amount than I would in an ordinary case where I did not have this extensive pocket. I have now separated the internal oblique and the transversalis and have freed the cecum from the ileum,

---

Fig. 3.—*a*, Right inguinal colostomy with tube sewed in to permit immediate drainage of colon without danger of soiling wound. In this case the obstruction was located in the sigmoid as evidenced by *x*-ray examination. The filling defect found in the *x*-ray plate is indicated in the diagram; *b*, tumor in sigmoid delivered preparatory to excision; *c*, lateral anastomosis of sigmoid following resection of the carcinoma.

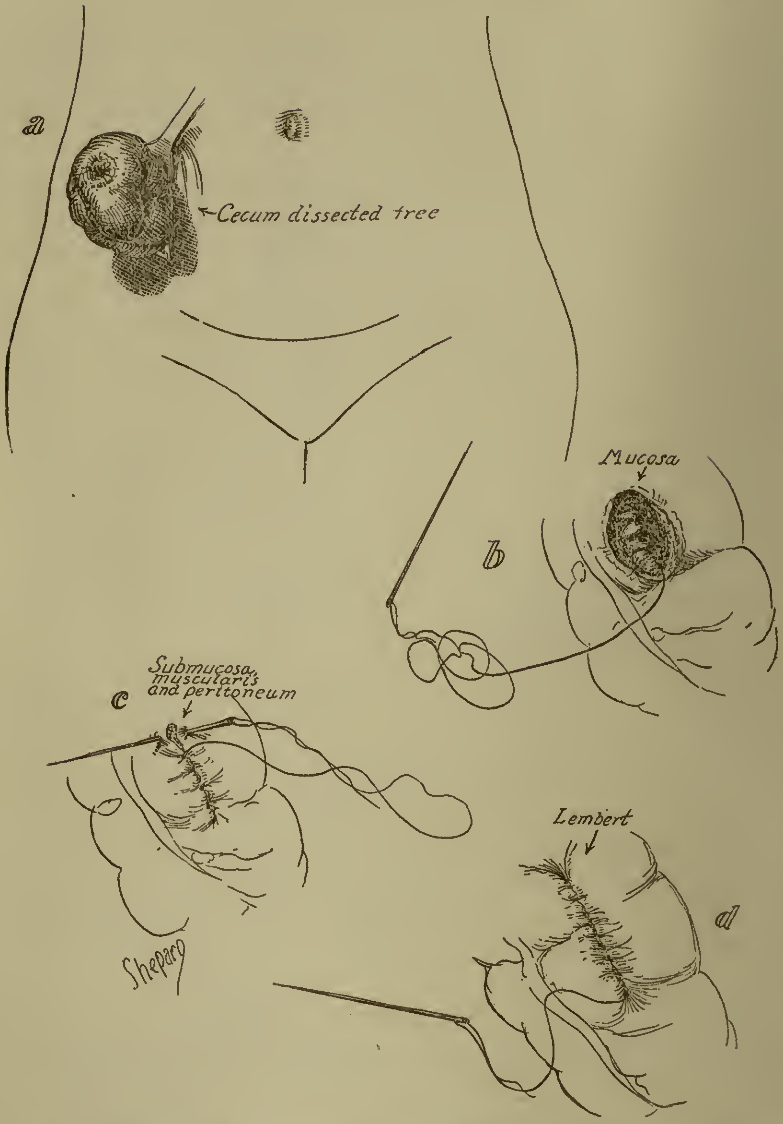

Fig. 4.—Third stage of operation—closure of colostomy opening: *a*, Cecum dissected free; *b*, *c*, *d*, closure of opening in cecum in three layers.

and, as you will notice, also the appendix, which is in view, so that I can close the colostomy opening and drop the intestines back into the peritoneal cavity (Fig. 4, *a*). In closure of the colostomy opening you will notice that I use three rows of sutures: one for the mucosa, one for the muscularis and peritoneum, and the other a Lembert (Fig. 4, *b*, *c*, *d*). I now replace the intestines in the abdominal cavity and close the muscle-splitting incision, just as one would an ordinary appendix incision. In the center, extending to the peritoneal cavity, I shall leave a small collapsible rubber tube for about forty-eight hours, removing it then if there is no evidence of suppuration.

The patient has stood the operation unusually well. If I had known how extensive the dissection was to be, on account of this pocket between the muscle layers, I should have preferred a general anesthetic.

I want to emphasize the importance of handling many of these cases of carcinoma of the large intestine in just the way that this case has been handled. Whenever one of these cases has progressed so far as to have marked intestinal obstruction symptoms at the time that you are called in to handle the case, and unless these obstructive symptoms can be relieved by the proper use of enemas, the method that has been adopted in this case should be followed, that is, a primary colostomy to relieve the obstruction, later resection of the carcinoma of the bowel, and, finally, a third stage, as I have shown you this morning. Too great emphasis cannot be placed upon the value of colostomy in cases of this kind. If one attempts to do a radical operation and remove the carcinoma of the colon during the period of intestinal obstruction, the mortality is very high, so high that a radical operation in the presence of obstruction should not be considered at all.

I am able to show you a second patient this morning upon whom we have recently done a very similar piece of work. This old man of sixty-eight was brought to my hospital service with marked symptoms of intestinal obstruction. It was impossible for us to make a definite diagnosis. The evidence seemed to favor an obturation ileus and seemed to favor the location of the lesion in the large intestine, but we had no data upon which to base a definite anatomic diagnosis. In order to save the patient's life I did a right-sided colostomy, and it was a question whether the patient would survive or not. He finally recovered from the immediate menace of the obstruction, and, to our surprise, even began to gain rapidly in weight and strength.

We then injected barium solution into the colon from below, made a fluoroscopic examination, took some *x*-ray plates, and

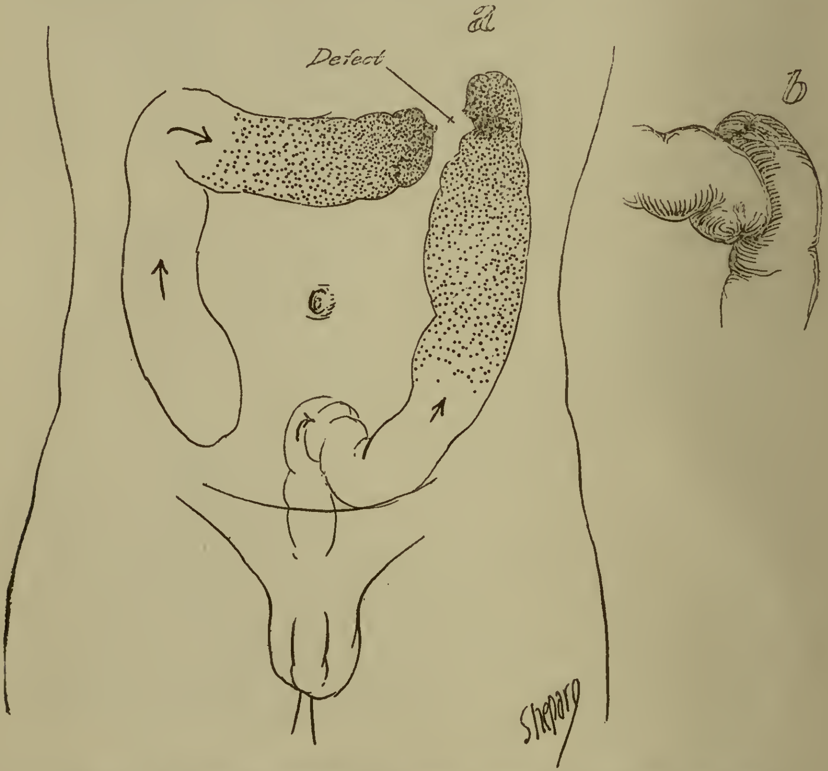

Fig. 5.—*a*, Diagram made from roentgenogram taken after injection of barium showing filling defect at splenic flexure; *b*, side-to-side anastomosis of transverse and descending colon after resection of diseased segment.

found a filling defect at the splenic flexure of the colon, showing that this was the location of the lesion (Fig. 5, *a*). At the second operation I made, as you will see by the scar, an S-shaped incision in the left upper quadrant. This enabled me to bring the splenic flexure easily out of the peritoneal cavity. I mobilized this thoroughly so that I could remove the lesion widely. I closed the two ends after resecting the carcinoma and made a side-to-side anastomosis of the transverse and descending colon (Fig. 5, *b*). Then at a third sitting I did the same operation that I showed you this morning, and under local anesthesia closed the colostomy opening.

This man has gained a great deal of weight and strength and apparently has some prospect of permanent cure and a very good prospect of long palliation from his carcinoma.

The cases in which we have adopted this three-stage method have progressed so satisfactorily and there has been so little mortality that I am inclined to give this method of handling carcinoma of the colon the preference over the Mikulicz method. I believe that the mortality is less. It is possible to remove the carcinoma more completely than by the Mikulicz method. On this point I want to say that when we adopted the Mikulicz method and drew the loop of large intestine containing the carcinoma out of the peritoneal cavity and outside of the abdominal wall, and later removed it, it was difficult for us to be sure that we removed all the involved mesentery or the glands in the mesentery that may have become infected by the carcinoma. A successful Mikulicz usually means at least three operative procedures, and sometimes more: first, the bringing out of the abdominal cavity the loop of bowel involved in the carcinoma; second, the cutting off of this loop; third, cutting out the bridge between the two loops of bowel with heavy forceps; and fourth, the closure of the opening in the bowel. Weighing all the evidence in both these methods, I would unhesitatingly recommend to you the method which I have adopted in these two cases as being safer for the patient from the standpoint of immediate mortality and giving the patient a larger chance of permanent cure, because we can do the operation under better control and can with greater certainty remove the entire lesion. Finally, in closing this discussion I want to emphasize again the grave risks involved from the condition of obstruction and the great value of a colostomy to remove these dangers before we consider anything like a radical removal of these malignant lesions of the colon.

APPENDICAL ABSCESS SIMULATING CARCINOMA OF THE ASCENDING COLON

Summary: A patient with a mass in the right side of the abdomen and presenting a filling defect in the ascending colon at the level of the mass; probable diagnosis—operation—exposure of lesion through muscle-splitting incision; this case a sound argument for exploratory operation.

THIS lady is a dentist, a woman of about fifty. Dr. L. C. Gatewood has had her under observation for some time. She came to him with a mass in the right side of the abdomen midway between the anterosuperior spine and the costal arch, and about 3 inches above McBurney's point. This mass was hard, firm, and somewhat tender. She had very moderate obstructive symptoms and a slight fever; there was no leukocytosis. Filling the colon with barium solution showed a filling defect, as you will see in the *x*-ray (Fig. 6, *a*), an irregular filling defect in the ascending colon about 6 inches from the ileocecal valve. While she was under observation the mass, which is the size of a good-sized lemon, diminished very materially within a few days, and this was associated with definite improvement in the patient's general condition. It left, however, the large filling defect showing in the colon and the irregular mass was not so definitely outlined. Dr. Gatewood has considered two probabilities in this case, one that of carcinoma of the ascending colon associated with a pericolonic abscess or pericolonic infection; second, that of appendical abscess which has emptied itself and has produced a definite filling defect from the extramural pressure.

Dr. Gatewood has devoted a good deal of time and study to the case, and I think weighed the evidence very judiciously. From the facts which he has submitted to me I quite agree with him that the diagnosis lies between these two pathologic conditions, and that it is impossible for one to make a definite diagnosis without an exploratory operation.

I shall now make quite a large muscle-splitting incision in the right lower quadrant, but make the incision about 2 inches higher than an ordinary appendix incision, and, as you see, I am making the incision at least 6 inches in length. After dividing the external oblique I separate the internal oblique and transversalis quite widely, splitting these muscles well up over the rectus. I am incising the peritoneum parallel with the skin incision. I do this because it will enable me to go higher up in

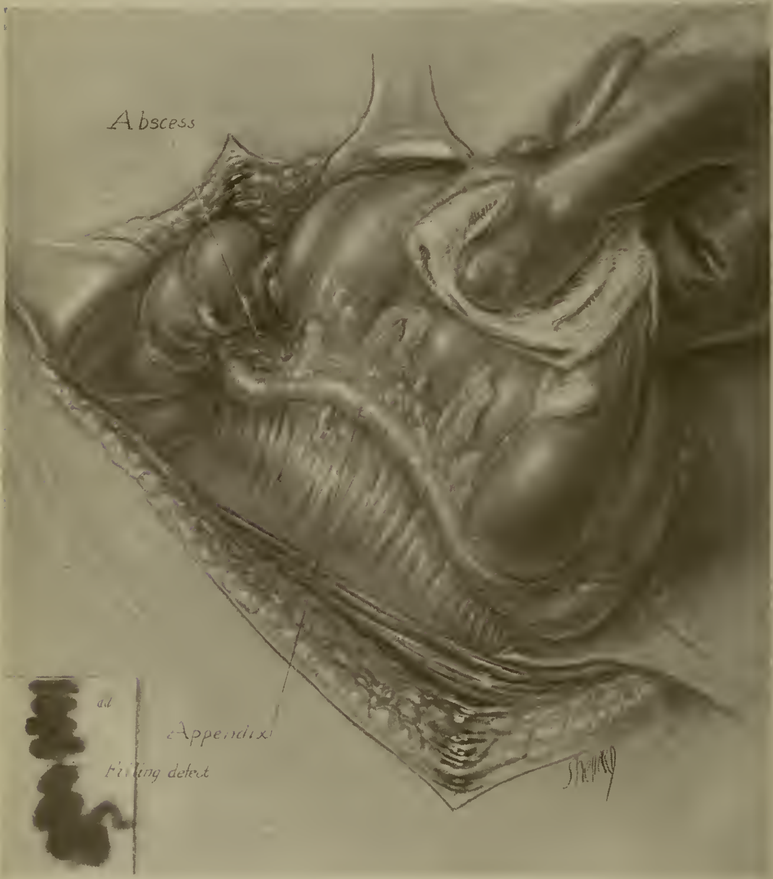

Fig. 6.—Adherent appendix with abscess invading the wall of the ascending colon; *a*, sketch of filling defect as revealed by the *x*-ray.

the abdominal cavity if I find that this is necessary. As a rule, in work of this kind I divide the peritoneum parallel with the incision in the transversalis and internal oblique.

I now draw out a very voluminous cecum and ileum. They are quite movable, and as I roll the cecum and ascending colon inward you see that I bring into view a very large swollen appendix twisted to the under side of the ascending colon, or rather to the under side of the cecum and the mesentery of the ascending colon (Fig. 6). As I trace the appendix upward and draw the ascending colon out of the incision, I come to a hard, firm mass about 6 inches above the ileocecal valve in the ascending colon, which feels very much like a carcinoma. This mass is about the size of an English walnut. It seems to invade the walls of the colon at this point, and it undoubtedly produces very marked diminution in the caliber of the gut just at the point that we find a marked filling defect in the *x*-ray. This mass feels like a carcinoma.

I shall dissect out the appendix. You will notice that it is necessary for me to do this with a very sharp knife, making small strokes and dividing the adhesions of the appendix to the mesentery. The tip of the appendix terminates in this hard mass in the colon, and as I dissect the tip of the appendix out I open into the mass, and find that the mass is an old abscess in the process of healing. It contains no free pus. It is lined with a yellow necrotic membrane, and it is quite clearly not carcinoma, but the remains of an appendical abscess, which is plastered to the colon, involves the wall of the colon, and has compromised the colon so as to give us the filling appearance of a carcinoma in the *x*-ray. The appendix is now completely freed, and I shall handle this in the usual way, cutting it off about $\frac{1}{8}$ inch from the cecum after clamping it, touching the stump with carbolic acid, invaginating the stump into the cecum, and retaining it in position first by a purse-string suture of Pagenstecher linen, and a second purse-string suture of fine catgut. Although there is no pus in this old abscess, there is undoubtedly infected tissue capable of producing infection after this operation. On that account I shall, for twenty-four or forty-eight hours or possibly longer, drain this area with a fine rubber tube which is carried down to the deep gutter lateral to the colon. The rest of the incision is closed in the usual way.

This case is an example of a class of cases which we not infrequently meet with, sometimes in young individuals, but especially in individuals of fifty years of age or more. As these people are in the carcinoma age of life, we are compelled to consider more frequently in their cases the possibility of carcinoma. I have had quite a large number of similar experiences where it was difficult or impossible to differentiate clinically between carcinoma of the bowel and subacute or chronic appendical abscess, and, of course, not infrequently both conditions often presented themselves, that is, an appendix that is the site of a carcinoma becoming acutely inflamed and giving us the clinical picture of acute appendicitis; or in rare cases a carcinoma of the bowel, presenting the picture of local peritonitis and suppuration about carcinoma.

I am inclined to believe that our best diagnosticians would have leaned, in the case which I have shown you this morning, to the diagnosis of carcinoma, especially because of the *x*-ray evidence of a filling defect. Usually in appendicitis with abscess we are able to exclude carcinoma because we do not find any filling defect present.

I might add as a last word in this discussion that a clinical picture of this kind is often regarded as a carcinoma and even as an inoperable carcinoma of the bowel, and often allowed to go to a fatal termination from an appendical abscess for lack of an exploratory operation, which would have cleared up the diagnosis and given the patient the benefit of a life-saving procedure had it been undertaken. I can remember a number of similar cases which I have seen in previous years, and this fact is an argument, and a strong one, in favor of giving these doubtful cases the benefit of an exploratory operation, because the evidence obtained at exploratory may show that the case is not only not hopeless but curable by proper surgical procedures.

IMPERFORATE ANUS

Summary: Colostomy in a child three days old. Pathologic anatomy of imperforate anus and modifications of operative procedure necessary to meet the various conditions which may be encountered. Necessity of maintaining complete independence of bowel and bladder—the specter of acute, ascending suppurative nephritis; illustrative cases.

The first patient I shall show you this morning is this infant three days old, who was brought here by his parents and family physician with the statement that he was born with an imperforate anus. You will see on examination that there is complete absence of any opening in the position of the normal anus. There is also another piece of evidence which throws a good deal of light on the case, that is, that the child has been passing some meconium through the urethra, showing that the blind end of the rectum and bladder form one large cloaca.

The indication here is very definite, and that is, to make an immediate colostomy. I can speak with some authority on this subject, as we have made a study of a number of similar cases. Nothing short of a colostomy should be considered, and the colostomy should be so planned that it will separate the bladder from the rectum, so as to prevent the death of the child from ascending nephritis, which is otherwise certain to result in a comparatively short time.

I shall have Dr. Herb give the child a small amount of ether so that we can do a colostomy. I shall make a small muscle-splitting incision on the left side, just the same sort of an incision that we use for appendectomy. I divide the skin and superficial fascia and external oblique and separate the internal oblique and transversalis by blunt dissection, open the peritoneum parallel with the skin incision, and draw the sigmoid loop into view. I take a waxed silk suture, which is doubled, and a good-sized curved needle and transfix first the inner side of the incision, going through the skin, superficial fascia, external oblique, and peritoneum (Fig. 7, *a*). Then, picking out an avascular area in the mesentery of the sigmoid, I transfix the mesentery close to the gut. I then pass the needle through the opposite side of the incision in the same way. I want to call your attention to the fact that this suture is doubled. I take two small pieces of cigarette drain and tie both ends of the suture over this like an old-fashioned quill suture (Fig. 7, *b*). This holds the loop of the sigmoid firmly in position, the suture acting as a bridge, and at the same time preventing the loop from either coming out or retracting into the abdominal cavity. The child is three days old and has not as yet had a bowel movement. There is rather marked abdominal distention and some vomiting. On that account I want to relieve the intra-intestinal pressure at once, and so I shall sew a No. 12 American catheter into this loop, making

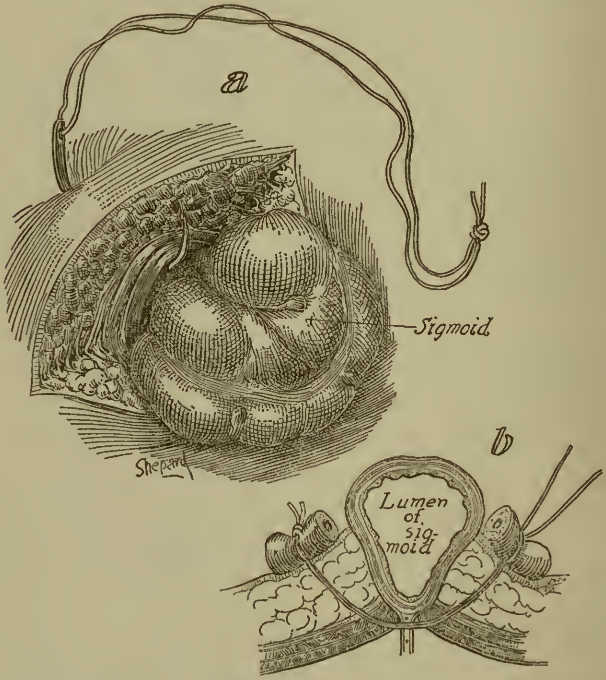

Fig. 7.—*a*, Technic of colostomy; double silk suture is passed in from one side through all layers of the abdominal wall, through mesosigmoid and out on opposite side of incision, again perforating the entire thickness of the abdominal wall; *b*, diagram showing relations of sigmoid, suture, and abdominal wall on completion of operation.

a puncture on top of the loop just large enough to allow me to introduce the catheter into the bowel and sew it in position with two fine purse-string sutures of Pagenstecher linen. This will at once relieve the gas pressure, and, as you see, a certain amount of tarry meconium at once comes out through the catheter. We can in this way keep the wound from becoming contaminated for the next forty-eight hours. I think this is important because in that length of time enough plastic peritonitis will have occurred around the loop to wall off the loop completely from the general peritoneal cavity and protect the peritoneum against invasion. The bridge which we have used will make quite a sharp flexure in the gut so as to separate the proximal from the

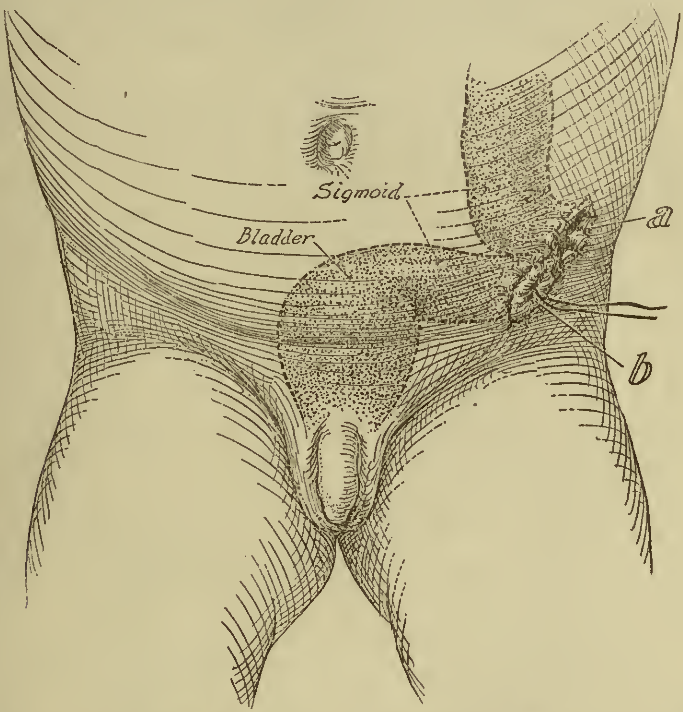

Fig. 8.—Second stage of operation for permanent colostomy: *a*, Proximal end of sigmoid left open to serve as artificial anus; *b*, distal end of sigmoid, communicating with bladder, closed with three purse-string sutures.

distal portions, that is, so as to divide the large intestine from the cloaca formed by the bladder and the blind end of the rectum. It will, however, be necessary for us to make this division between the bladder and rectum complete in order to prevent ascending nephritis. I do not think it will be wise to do this at the first sitting, and possibly not for another week or ten days, but from our experience in similar cases it will be essential to separate the bladder from the rectum completely by an operation, which we can do under local anesthesia (Fig. 8).

I shall take this opportunity to discuss this whole subject rather completely. First, let me say a word in regard to the various types of imperforate anus which we meet with clinically. The simplest type (Fig. 9, *a*) is where the rectum is quite complete, except that it is closed off from the external skin at the anus simply by a thin septum of skin and mucous membrane. I have met with several examples of this type where all it was necessary to do was to divide the skin and mucous membrane and at once enter the blind end of the rectum and stretch the opening large enough, being careful to make the opening at exactly the center of the external sphincter, which in cases of this kind is normal. The skin is then sewed to the mucous membrane with a number of fine silk sutures. Care is taken to avoid stricture at the anus in the after-treatment, and the child goes on to a normal recovery and to normal development. These fortunate cases are the exception rather than the rule.

The second type (Fig. 9, *b*) is one in which the rectum ends blindly, but well up in the pelvis, an inch or more from its normal position. It is possible, too, in these cases by dissection to bring the blind end of the rectum down and unite the rectum to the skin in the normal position of the anus. I have assisted myself materially in cases of this type by introducing an aspirating needle through the center of the anus, or where the anus should be, using a needle of large size, and introducing it in the direction of the anus, withdrawing the piston as the needle is introduced, and finally entering the blind end of the bowel, sucking some meconium out into the syringe, and determining

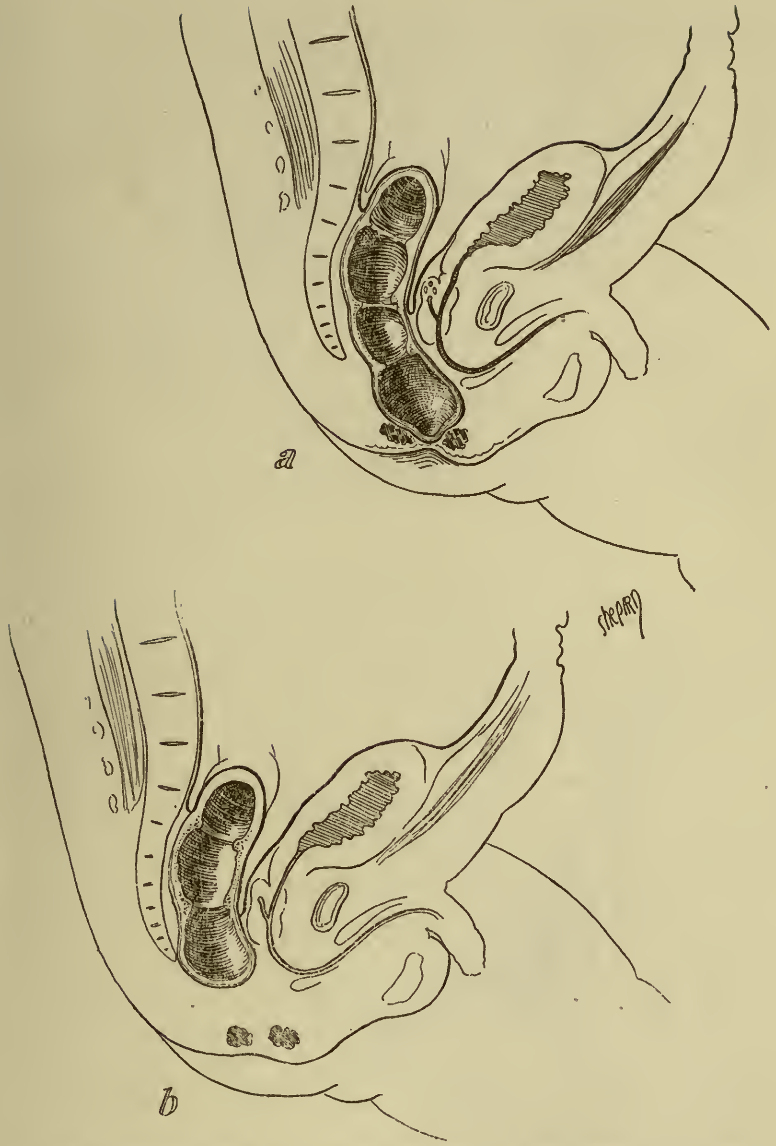

Fig. 9.—Simple types of imperforate anus: *a*, The rectum is complete, lacking only the anal opening; *b*, the rectum here ends an inch or more from its normal position.

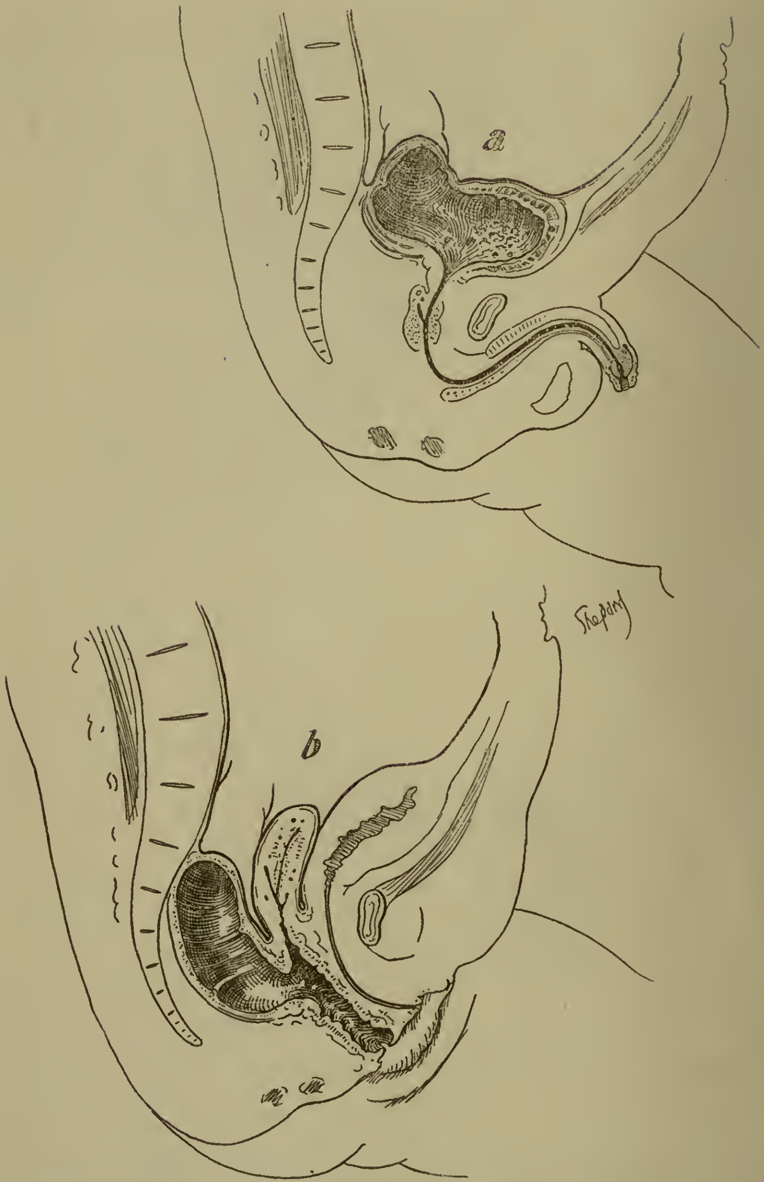

Fig. 10.—More complicated types of imperforate anus: *a*, Persistence of embryonic cloaca, bladder and rectum communicating; *b*, rectum discharging through vagina.

in this way the location of the blind end of the pouch and the depth from the external integument.

Another type is the one in which the blind end of the bowel connects with the bladder or with the vagina. Where it connects with the vagina, if the opening can be easily found and dilated, it is better to allow the bowel movements to discharge in this way through the vagina until the child is a year or two of age before taking up the question of attempting to restore the structures to normal (Fig. 10, *b*).

The type which we have operated on today represents a type where the bladder and rectum form one general cavity, so that feces are extruded through the urethra (Fig. 10, *a*). In this type, as I have already said, the indication is imperative to give the child relief by colostomy, and very early to separate the bladder from the rectal cavities and so prevent death from ascending nephritis.

After we have operated upon one of these little patients and saved its life by colostomy we are within a short time confronted by the parents with the question: How are you going to complete the cure of the child? I have studied this problem carefully and with a good deal of interest in a number of cases, and shall give you the benefit of the conclusions which I have arrived at in this particular type of case.

At one time I thought it was probable that after these children grew to be four or five years of age we might consider the proposition of separating the bladder from the rectal cavities, and eventually, by doing a Kraske, attempt at least to make a new rectum in the normal position. The attempts which I have made, however, to accomplish this have not been successful, and I believe now that they were ill-advised and that we should be satisfied in cases of this type to save the child's life and prevent ascending nephritis, and have the child go through life with an inguinal anus, which is, after all, not a very great hardship if it is intelligently handled by the patient. As long as the patient is a child, of course, it must be attended to by its parents or attendants, but after the child grows up he can learn how to handle an inguinal anus with really a good deal of comfort, or at least without very great discomfort. These patients learn how to have a bowel movement once a day at certain definite periods, and most of them can be made quite comfortable with an ordinary clean gauze pad over the inguinal opening. If there is any tendency to looseness of the bowels a colostomy cup can be worn and cleaned as often as required.

In a number of these cases we have found a tendency to prolapse of the sigmoid after colostomy, and I have in several cases had to operate repeatedly for the purpose of curing this condition. We may either remove the excess portions of the bowel, and this can be done by careful dissection under local anesthesia, or we can very often replace the prolapsed portion and make a complete closure of the distal loop—the portion which prolapses—by dividing the bowel completely, sewing up the mucosa, muscularis, and peritoneum by purse-string suture, invaginating the end of the stump, and closing the abdominal wall firmly over the invaginated stump.

I want to call your attention to the serious import of the ascending nephritis that occurs in these cases. This same condition can occur in other lesions, such as exstrophy of the bladder, where an operation for relief of the condition has been made, implanting the ureters into the rectum or the base of the bladder into the large intestine, such as the sigmoid; here the danger of ascending nephritis is very great, so great, in fact, that most of these patients ultimately die from kidney infections. Another condition in which I have seen ascending nephritis develop is that in which either from infection or from carcinoma a communication develops between the intestine and the bladder. I recall one case which illustrates this clinical picture very well.

A man of forty was brought to the hospital with what was regarded as a prostatic abscess. He was handled conservatively on the medical service for a few days and suffered great pain. Finally there was a discharge of pus evidently into the bladder and out through the urethra. This was followed very shortly by a discharge of gas and fecal matter through the urethral opening, for a communication had been formed between the bowel and the bladder. The man became violently ill and septic, with acute ascending suppurative nephritis on both sides, and in order to save his life I did a colostomy under gas anesthesia, separating the bowel from the bladder and then washing out the bladder. He very quickly improved and recovered from the immediate severe infection.

He suffered, however, more or less from cystitis, and finally developed a stone in his bladder. I removed the stone and at the same time closed the distal end of my colostomy opening so as to prevent absolutely any fecal matter from passing into the bladder. He went on to a complete recovery, regained his health, and had no trouble except for the existence of the inguinal anus. In analyzing the facts carefully I finally came to the conclusion that the case had been primarily one of acute appendicitis with appendical abscess which had ruptured into the bladder. I finally persuaded the patient to have another operation, at which I exposed the appendix and found that my surmise was correct. The appendix was wedged down in the pelvis between the rectum and the bladder. Evidently the appendicitis had resulted in an abscess which had opened both into the bowel and into the bladder. I very carefully removed the appendix, and could find at that late date no evidence of a communication between the bladder and the rectum. I took it for granted that that had closed. After he recovered from this operation I then suggested to him that we were in a position to restore the continuity of the sigmoid and put him in good condition. He was anxious to have this done. I operated upon him, and found that with very little difficulty we could free the sigmoid from the colostomy scar, close the opening, and close the abdominal wound. The patient did very well for about forty-eight hours, and then, much to my distress, he began to pass gas and fecal matter from the bladder. He had chills and fever, pus and blood in the urine, and evidently a return of the ascending nephritis. I at once sent him to the operating room and restored his colostomy opening, separating the proximal from the distal portion of the bowel completely, so as to prevent any further contamination of the bladder. This operation was followed by immediate recovery, and the patient is now working every day and is in very good general health, and is more than satisfied with his inguinal anus.

On the basis, therefore, of the experience which I have had in this group of cases I would recommend in these cases of imperforate anus, where there is a communication between the blind pouch and the bladder, that we make a permanent colostomy, separating the rectum entirely from the bladder pouch, and that we do not undertake any further operative procedures to restore the conditions to normal, because of the great risk of ascending nephritis to which we submit the patient in these operations, and because there is very little chance of succeeding in restoring the individual to normal, and in the third place, because any result that we can obtain will probably not be functionally as satisfactory as an inguinal anus.

GAUZE SPONGE LEFT IN GALL-BLADDER—REMOVAL AFTER INTERVAL OF ELEVEN YEARS

Summary: Recurrent painless swelling at site of old scar in gall-bladder region; probable diagnosis; discovery of cholesterol-encrusted sponge in the gall-bladder as the cause of the pathology; cholecystectomy.

This patient gives the following history:

He is fifty-five years of age. Eleven years ago he was operated on for supposed gall-bladder trouble. A small incision was made over the gall-bladder. No stones were found at that time and the gall-bladder was not removed. Apparently the wound was simply drained temporarily and then closed. It remained closed until about five weeks ago, that is, for a period of about eleven years. During the eleven years he gives the peculiar history of having had more or less distress in the gall-bladder region and that at times there would be a swelling which he could distinctly feel and which would be tender for some time. The tenderness and the swelling would then disappear. About five weeks ago a swelling of this kind occurred, and following the swelling there developed a little fistula about the center of the old scar over the gall-bladder. This fistula has persisted since that time, discharging some serum and pus. He has never been jaundiced. His general condition has been good. He is a farmer and he has been able to do his regular farm work during almost this entire period. He has not had any outspoken attacks of colic which could definitely be diagnosed as gall-stone colic during this period.

I have discussed the matter pretty fully with his attending physician and have thought of several possibilities, one, of course, that he has gall-stones in his gall-bladder and that the swellings that he describes have been attacks of cholelithiasis with distention of the gall-bladder, and later the emptying of the contents of the gall-bladder through the cystic duct and the disappearance of the swelling. It is singular, however, that these attacks of swelling in this region have been associated with so little pain. The man has been able to be about with his work almost all the time in spite of these occasional attacks.

Another possibility that occurs to me is that there is some foreign body, in the way of a stitch left in the original operating wound, which has been the cause of the difficulty and the cause of the present fistula. I believe that it is wise, however, to put the man asleep and investigate the fistula carefully and find out the exact cause of the trouble.

He is now etherized, and I shall dissect out the old scar, as we always do in these second operations, because scar tissue is always a menace to good wound healing. I shall dissect out not only the scar, but, of course, the fistulous tract as well. I shall make a larger incision than was made originally in this case. The original incision evidently was a very small one, not more than 2 inches in length, very much smaller than the one we employ in our gall-bladder work in this clinic. I shall add the upper and lower parts of our regular **S**-shaped incision to the line of the old incision in this case. I have thoroughly disinfected the fistulous tract with tincture of iodin and shall pack the tract with a little iodoform gauze as we proceed with the dissection.

Opening the peritoneal cavity, I come down first to the stomach and pylorus. On introducing my fingers I find a large, hard mass attached to the pyloric end of the stomach. It feels like a carcinoma. I am very much surprised at this because there has been no evidence of stomach trouble, and yet my first impression is that it is a carcinoma at the pyloric end of the stomach. Separating the adhesions, which are very firm and difficult to separate, I find that the liver, stomach, duodenum, and omentum are all bound in one mass in this position. Taking a probe and introducing it, which I can do now, into this mass, I find that it gives me the sense of passing a probe along a brick, a rough, grating sensation, as though I were running a probe down into dead bone. It is difficult for me to understand just what we have to deal with. We shall, therefore, free very widely this entire region from adhesions and determine, if possible, the exact pathology. Continuing my separation so I can put my fingers down into the abdomen, I feel the pancreas and the foramen of Winslow. I can now make out that I have a very large stone filling the gall-bladder completely, and that the gall-bladder is adherent to the stomach. It is evidently not a carcinoma of the stomach, but a very long, peculiarly shaped stone filling the gall-bladder, and this gall-bladder is surrounded by very dense inflammatory adhesions. I have just told you that the liver, gall-bladder, duodenum, and omentum form one large mass. I shall attempt to separate the fundus of the gall-bladder from the liver. You will notice, as I do this, that there has been extensive inflammation around the gall-bladder which has invaded the liver, leaving yellow necrotic areas in the liver tissue, and that it is necessary for me to dissect this inflamed gall-bladder from the liver, going through this inflamed liver tissue. There is a good deal of hemorrhage which I control by packing with gauze with artery forceps, and finally I am able to separate the fundus of the gall-bladder from the liver, working my way along the body of the gall-bladder until I come down to the cystic duct. I have kept this infected field well walled off from the rest of the abdominal cavity by abdominal pads. I shall now open the gall-bladder and remove the stone, making an incision through the fundus of the gall-bladder and attempting to pick out the stone. You see I draw out a very singular mass. As I hold it up to you you will see that it is a sponge or possibly a gauze packing which has been left in the gall-bladder, and around this has formed this long gall-stone, the whole being about 4 inches in length (Fig. 11). The portion of the gall-stone which is down in the neck of the gall-bladder is very solid. The fact is, this mass, as you see as I pull the gauze out, is composed of a piece of gauze covered with a thin cholesterol shell, which I can readily separate. There are no other gall-stones in the gall-bladder and I shall proceed to do our usual cholecystectomy in this case. I do this because of the fact that this gall-bladder wall is so thickened and inflamed that I believe it will be wiser for us to get rid of the viscus than simply to remove the gauze and the gall-stone.

You are no more surprised at the findings in this case than I am. It seems almost impossible that this piece of gauze, forming

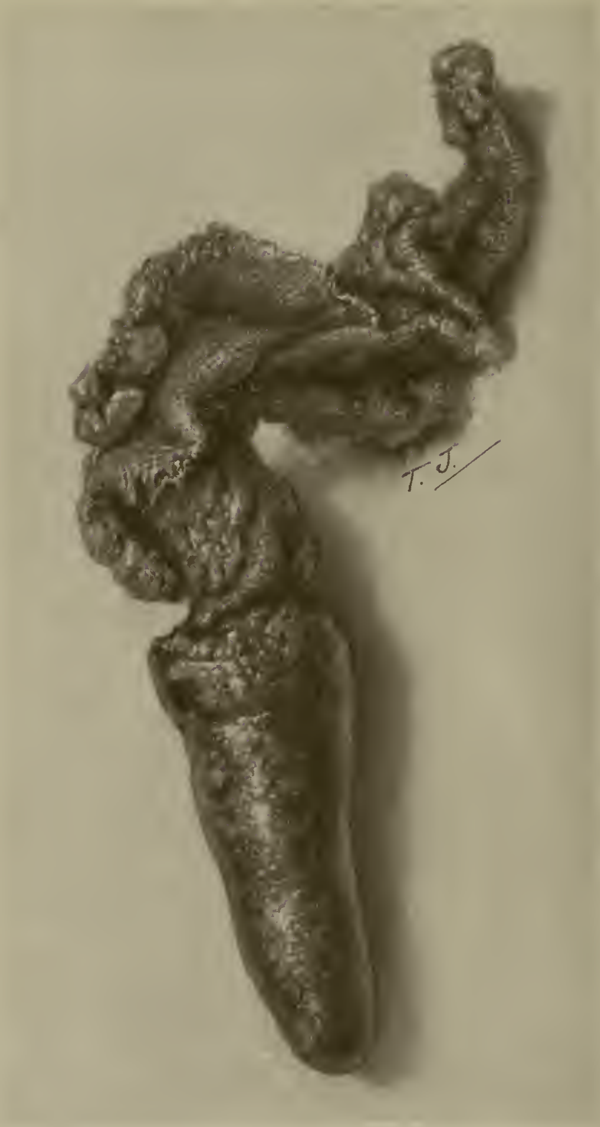

Fig. 11.—Cholesterol encrusted gauze sponge removed at operation.

the nucleus of this large gall-stone, should be left in the gall-bladder for eleven years without doing more damage than has occurred in this case. Yet I suppose the explanation is that the cystic duct was free, as we found it, of good size and movable, carrying off the products of infection which must have constantly been present in this case.

I shall pack the wound with one strip of iodoform gauze down to the cystic duct, and around this infected area of the liver introduce one good-sized rubber tube containing a wick of iodoform gauze, and close the rest of the incision.

After-history.—The man went on to a satisfactory recovery. Examination of the gall-bladder showed no evidence of carcinoma, the entire pathology being the presence of this piece of gauze, which had been evidently overlooked at the time of the first operation.

I do not think it is necessary for me to explain all these facts to the patient. The surgeon who left the gauze in evidently did so by mistake, not intentionally, of course. I suppose that the case has been outlawed legally, though I am not sufficiently familiar with the legal side of cases of this kind, because of the long term of years which has elapsed. I am informed by the attending physician that the surgeon who operated on the case died some years ago. I feel, therefore, that the patient and his family will feel easier if they simply know that we removed a large gallstone in his gall-bladder and removed the gall-bladder as well. Certainly no good would come either to the patient or to any one concerned if he knew that it was due to the leaving in of a sponge. The case is certainly most instructive and I am glad of having the opportunity of presenting it to you.

CLINIC OF DR. E. WYLLYS ANDREWS

Mercy and St. Luke's Hospitals

CHRONIC CHOLECYSTITIS AND CHOLELITHIASIS WITH POSITIVE x-RAY DIAGNOSIS

Summary: Characteristic x-ray appearance of gall-stones. Difficulty of differentiating certain common duct stones from carcinoma. Anastomosis of gall-bladder with stomach as a means of relieving jaundice in cases of malignant obstruction of common duct.

This is one of the cases, probably a minority, which give positive findings in the radiogram (Fig. 12). Note the double row of large facetted stones in a very unusual position, namely, from the right upper quadrant downward and inward beyond the pelvic brim like a row of ureteral calculi in position. Note, however, that these stones give weaker shadows and look annular—that is, like opaque rings. Why? Because the shadow-casting material is only an outer coating on a transparent cholesterin core. This is characteristic and diagnostic, in my experience, of gall-stone pictures.

Usually the facetted stones are gall-stones and their grouping is spheric or pear shaped and in the hepatic shadow or adjoining it. We must extirpate this gall-bladder. It is 8 or 9 inches long and 1 inch wide. I will have it radiographed while fresh and also laid open and photographed (Figs. 13, 14).

This gall-bladder is long enough to hang well down to the promontory of the sacrum. I remove it by a technic recently detailed in this clinic and close the wound with a Bullitt drain down to the common duct.

I will now describe certain early signs in this case which caused me to fear, and almost to be convinced, that it was an abdominal tumor, probably malignant.

The gall-bladder when first examined was distended to the size of a child's head. It was not very painful and no signs of cholangitis had appeared nor any colic or jaundice. The hard mass extended from liver to pelvis and the patient was failing in health and losing weight. I ordered radiotherapy and watchful waiting, and was rather surprised to see the tumor reduce and all

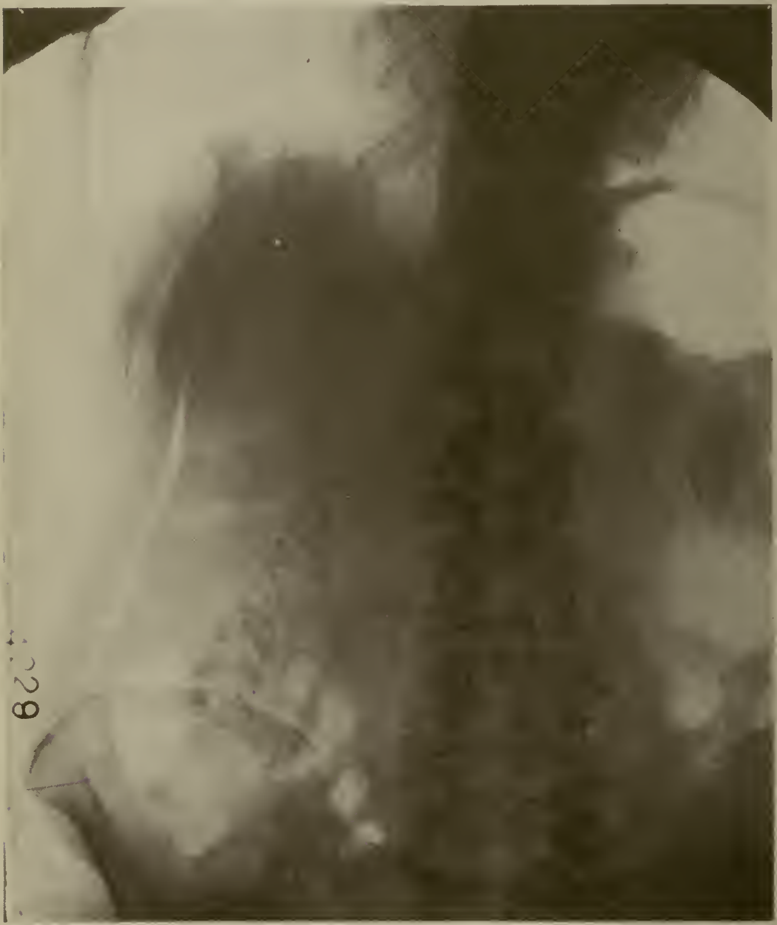

Fig. 12.—Radiogram showing characteristic features of *x*-ray shadows of gall-stones.

the symptoms abate in three months, and then to get the positive radiographs of gall-stones.

Probably the radiotherapy did not bring about the reduction. Rather, this was one of the usual fluctuations seen in hydrops and empyema of the gall-bladder.

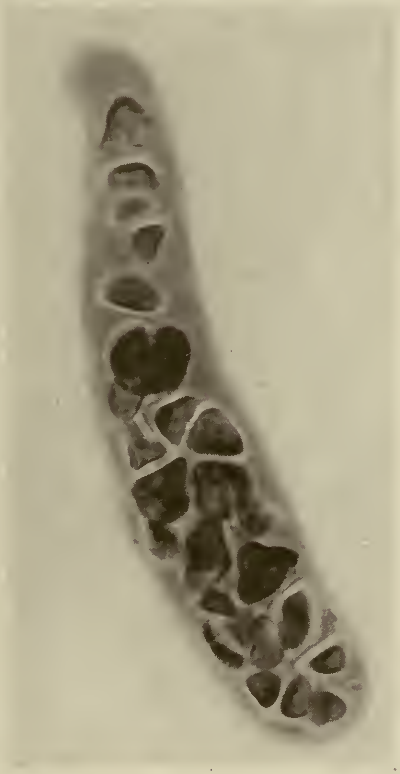

Fig. 13.—Radiogram of gall-bladder after removal from patient; compare with Fig. 12.

One other type of gall-stone disease is more often mistaken for cancer. This is the large single stone impacted in the common or cystic duct with deep permanent jaundice and emaciation.

Such cases seem almost certainly malignant, as they have few or no paroxysms or remissions and often no characteristic gall-stone colic. They live for months and finally die with marasmus, like cancer cases, only to reveal at the autopsy a condition which might have been relieved.

Since seeing such autopsies I have been on guard against this error, and have had 2 such cases which I successfully operated upon after several months of deep jaundice in patients given up as hopeless carcinoma cases. In each I found the same condition, extensive adhesions and a very large single stone extremely difficult of removal, and in both cases had a recovery.

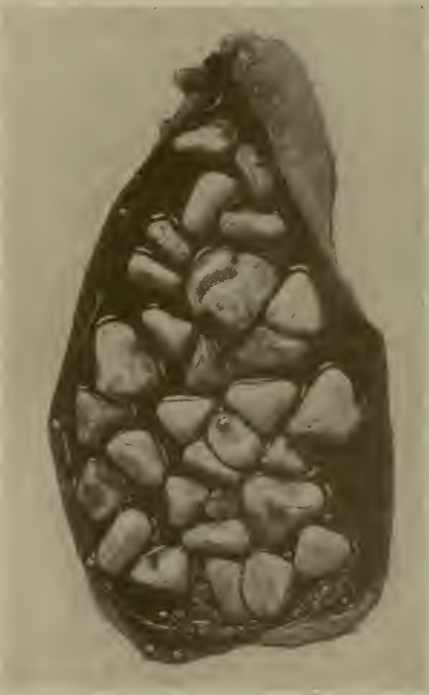

Fig. 14.—Photograph of same gall-bladder featured in Figs. 12 and 13 cut open to show the stones *in situ.*

It is not to be denied that all too many gall-stone cases are associated with cancer of the ducts or of the pancreas or pylorus. Also it is true that we should avoid operating in cholemia when we can. Nevertheless, this type I have described is a distinct entity, a form not to be forgotten in our classification.

Should carcinoma unhappily be found, we still may do much to relieve the jaundice and prolong life. We may, for instance, do a cholecysto-enterostomy or—often still better—anastomose the gall-bladder to the stomach or even—when nothing else is possible—to the colon. Any of these is to be elected rather than a permanent bile fistula. My best results have been from anastomosing to the stomach, probably because the organs are less displaced than with the jejunum, and also because "nature's apothecary," as Patterson of London calls bile regurgitation, often aids digestion.

Should all these methods of internal anastomoses fail and a permanent bile fistula result, the bile should be collected and fed daily to the patient by mouth, when the acholic stools will regain their normal color.

TWO CASES OF MYELOMA

Summary: Diagnosis of myeloma; differentiation from bone cyst, sarcoma, and infection. Treatment—utilization of a piece of rib with costal cartilage attached to fill bone defect involving joint. Bence-Jones albumosuria.

The first patient is a Russian laborer, single, aged forty. He complains of pain in the left knee, which began eight months ago, and has gradually increased in severity. He is in no sense incapacitated and is able to do a full day's work, but at night is kept awake by severe lancinating pains in the inner side of the right knee. During the day the pain has no relation to exercise, in fact, it is often worse when he is resting There is no other complaint.

His past history is negative except for typhus seven years ago. He denies venereal disease. The urine is normal. White blood count, 12,000. Wassermann is negative.

The patient is a robust man, and physical examination reveals nothing except that the inner condyle of the left femur is symmetrically enlarged, anteriorly and medially. It is not tender and there are no changes in the overlying soft tissues. The movements of the joint are free in all directions and painless. There is no fluid in the knee-joint. The inguinal glands are not enlarged.

The radiograph (Fig. 15) tells the story. We see that in an area larger than a hen's egg in the lower end of the femur the bone has been almost completely destroyed and the whole condyle is enlarged, being merely a shell of bone. There is no evidence of any infectious process, no necrosis, no spurs or new bone formation from the periosteum. The condition is evidently a neoplasm. The diagnosis rests between true bone sarcoma, bone-cyst, and the so-called giant-cell sarcoma. Bone cysts contain a clear straw-colored fluid, and the radiograph does not show a clear center to this tumor. Also it is not spheric and not so sharply outlined as we would expect a cyst to be. A true sarcoma usually grows more rapidly than this, and would have caused more destruction and overgrowth of bone from the periosteum. I regard the term "giant-call sarcoma" applied to myeloma as a misnomer. The tumor is not a sarcoma. It does not infiltrate and does not give rise to metastases. Microscopically, we see merely a tumor composed of the cells of red bone-marrow. The "giant cells" are merely osteoclasts, a normal constituent of bone-marrow. Clinically, local removal

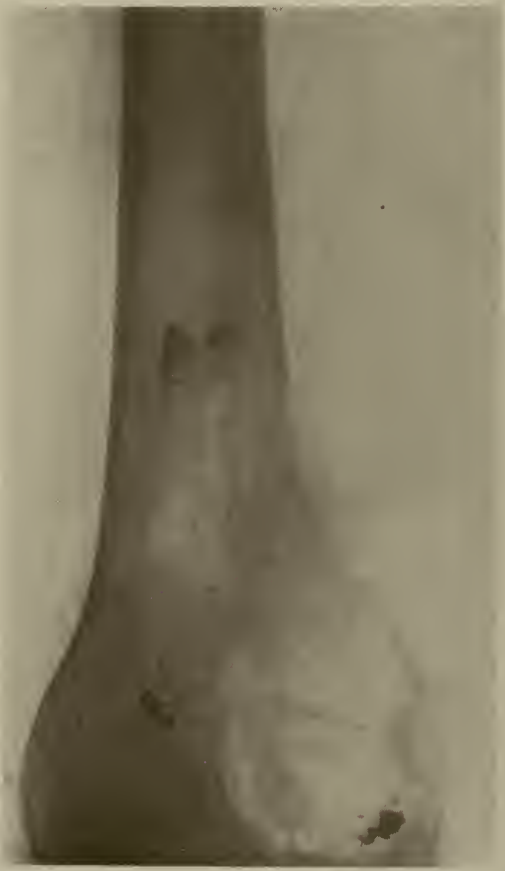

Fig. 15.—Myeloma attacking lower end of femur; note characteristic *x*-ray appearance.

is sufficient and recurrences are infrequent. However, the condition should not be neglected, as a true sarcoma may develop from the benign myeloma. If this does take place and metastases occur, they are like other sarcomas histologically and do not contain giant cells.

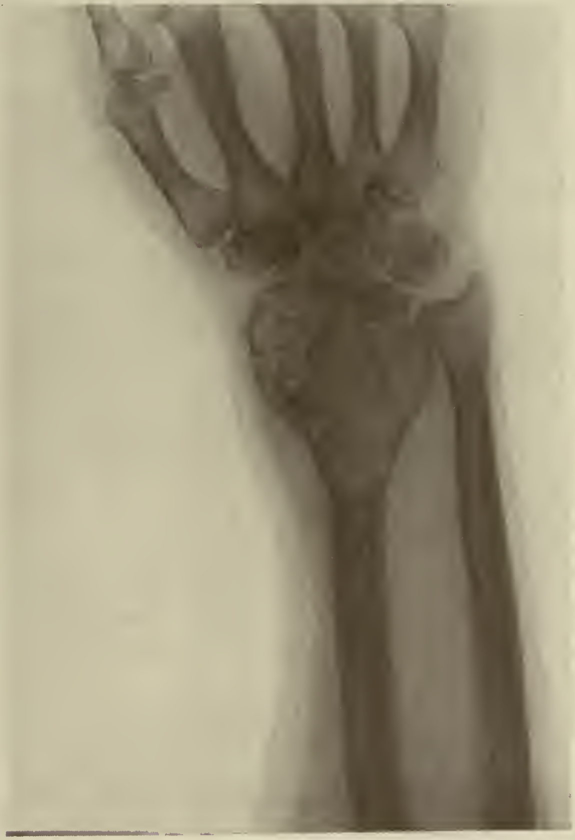

Fig. 16.—Myeloma (recurrent) in lower end of radius; compare with Fig. 15

After driving the blood out of the leg with an Esmarch bandage and applying a constrictor, we make a longitudinal incision over the inner aspect of the knee just above the joint level, going between the internal hamstrings and the quadriceps. A few oblique fibers of the vastus internus must be divided. The inner condyle appears firm and strong except an area 1 by 2 inches on its inner aspect, where the tumor has eaten through to the periosteum. This area of periosteum is excised and we break into a cavity full of a red jelly-like tissue with scraps of bone in it. This is scooped out and with a sharp curet the sides are scraped away until we come down to normal yellow marrow. Fortunately, in this case it is not necessary to open into the knee-joint. As we remove the constrictor we see that the hemorrhage is so sharp that it will be necessary to pack the cavity. I would prefer to close it without drainage and allow a sterile clot to obliterate the cavity and become organized. However, we will remove the packing in two days, and I hope that it will remain sterile.

The next case is a woman aged thirty-eight, whom I saw first in January, 1919. She gave a history of pain in the left wrist of about three years' duration. There was a slight enlargement of the head of the radius, but no interference with the function of the wrist-joint. The radiograph (Fig. 16) was very similar to that in the last case, except that the tumor seemed to approach more closely to the articular cartilage. At that time I cureted out the growth and closed the wound without drainage, but did not remove the cartilage. As you see, recurrence has now taken place. Plates now are little different from those made postoperative last January. There is no repair and the cavity has filled with soft tissues and is slightly but definitely larger, in spite of vigorous x-ray therapy.

I am going in through the old scar, making my incision slightly longer. I had hoped to be able to resect the head of the radius subperiosteally, but I see that that is impossible. It is a spongy mass with the periosteum adherent and hopelessly mixed with the tumor. However, I am leaving as much periosteum as possible, mostly in small shreds and patches. The articular cartilage is also involved and must be sacrificed. Now we have removed the lower 2 inches of the radius, leaving only scraps of periosteum to replace it. We must fill in the cavity with a bone transplant. Ordinarily the tibia is the place of election to get the bone from, but in this case I am anxious to get cartilage as well, in hopes of replacing the articular cartilage, as you see the wound opens directly into the wrist-joint. Therefore, I am taking a portion of the sixth rib along with its costal cartilage. In removing a normal rib for transplant much greater care is needed in resecting it subperiosteally than in empyema operations, where we are dealing with a thickened pleura. The normal pleura is thin and easily perforated. I next place this bone in the cavity with the cartilage in the joint end and close the wound without drainage. I do not expect this transplant to act very much as a mechanical support. We will provide that in a splint, to prevent radial luxation of the carpus. Its principal function will be as a stmulus to new bone formation, and I have hopes of a good serviceable wrist.

Neither of these cases showed one of the characteristic symptoms of myeloma: that is, the Bence-Jones bodies in the urine. This substance is precipitated from the urine on heating moderately, and then redissolves on boiling. The precipitation occurs at 40° to 60° C., dependent on the acidity of the urine. It is related to the proteoses, but is more complex. Its significance is unknown.

CLINIC OF DR. DANIEL N. EISENDRATH

Michael Reese Hospital

THE INGUINAL ROUTE IN FEMORAL HERNIOTOMY

Summary: Two cases of femoral hernia operated by approaching the neck of the sac through the incision usually made for the repair of inguinal hernia, and closing the femoral opening by approximating the ligaments of Cooper and Poupart. Advantages of this method, especially in cases of strangulated hernia or those with adherent contents. Description of technic as employed in a third case and demonstrated at the clinic.

These two patients have been operated upon for femoral hernia through an incision usually made for the repair of inguinal hernia, a method first described by A. V. Moschcowitz,[1] and later called to the attention of surgeons by Seelig and Tuholske.[2] Before pointing out the advantages of this method and the details of the technic to be employed in the third case, let me present two patients upon whom I have previously operated by this method.

This patient is thirty-six years of age. She was sent for immediate operation from a suburb of the city, with the diagnosis of strangulated femoral hernia. The physician who had first seen her stated that he had been called on account of the inability of the patient to reduce a swelling in the left femoral region which had existed for several months. During the following twelve hours the patient vomited three times, and the physician wisely refrained from repeated attempts to reduce the swelling, and also did not wait until the abdomen had become distended and complete inability to pass flatus and feces had supervened before sending her to a hospital. If every practitioner would do this, fewer cases of advanced intestinal obstruction, which require extensive resections with greatly increased mortality, would be seen.

---

[1] New York State Journal of Medicine, October, 1907, 396.

[2] Surgery, Gynecology, and Obstetrics, January, 1914, 18, 55.

My first examination revealed a tense, irreducible swelling over the left Scarpa triangle. An incision over this mass showed a femoral hernial sac. Its contents consisted of a portion of the bladder with a constriction at the femoral ring which prevented its reduction. The bladder as one of the possible contents occurs more frequently in inguinal than in femoral hernia. The incarceration of the bladder had given rise to symptoms resembling those of a strangulated hernia of the intestine in the early hours, *i. e.*, before a marked degree of interference with the nutrition of the gut and of obstruction of the fecal current has taken place. By extending the incision in an upward direction and opening the inguinal canal the constriction at the femoral ring was rendered easily accessible and could be divided without injury to the bladder. The latter was replaced into the true pelvis after the hernial sac, which, like the finger of a glove, had accompanied the bladder, was separated and ligated high up. The remaining steps of the technic and the advantages of the method of Moschcowitz in such cases will be described when I take up the case upon which we shall operate today.

Our second patient is a woman who was admitted to the service of a colleague about two years ago with the diagnosis of strangulated femoral hernia. At operation a coil of small intestine was found in a gangrenous condition, and a resection with lateral anastomosis was done through the incision generally made for the repair of femoral hernia. She left the hospital with a fecal fistula, and was readmitted to my service about two months later for the correction of this condition. Through a left pararectal incision the intraperitoneal contents of the left iliac region were examined and the fistula found to be located at the convexity of the loop upon which the lateral anastomosis had been done (Fig. 17). The intestinal contents not only passed through the anastomotic stoma, but around it, because the ends of the gut had not been closed beyond the point of anastomosis. The fistulous opening was located opposite the femoral ring and there was a constant escape of fecal matter through the femoral canal to the surface of the thigh. I resected the loop beyond the anastomosis and closed the ends in the usual manner. It was impossible, however, to repair the

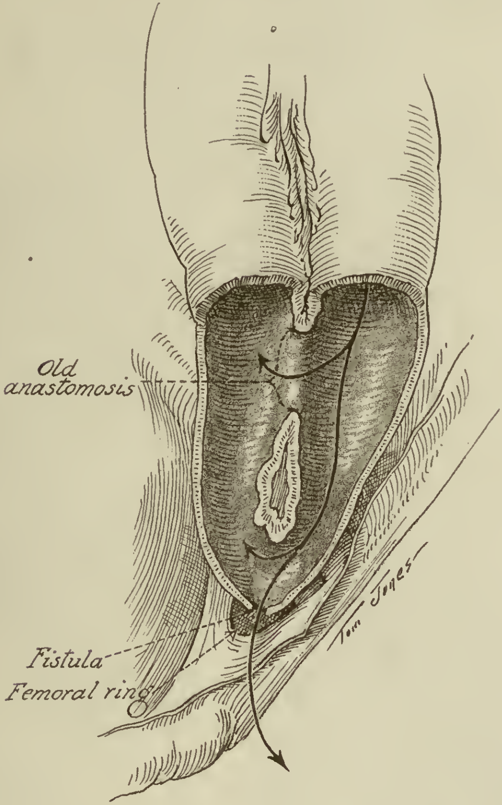

Fig. 17.—Diagrammatic representation of condition found at second operation in Case II. The arrows indicate how fecal contents of bowel were able to pass through the lateral anastomosis as well as through the distal portion of the loop and a fistulous opening at the convexity of the unclosed portion of the loop. There was constant escape of fecal material from the fistula through the femoral ring and canal to the surface at Scarpa's triangle. Second operation had as its object the closure of this fistula.

femoral opening, owing to the infected condition of the entire old hernial tract. The patient made an uneventful recovery from this second operation, but returned a few weeks ago—*i. e.*, about two years after the original resection—with a swelling about the size of a child's head at term, over the anterior aspect of the left thigh, in the vicinity of the old hernia (Figs. 18, 19). The swelling was not reducible, and the skin covering the recurrent hernial sac was so thin that peristaltic waves could be seen in the coils of the intestine which composed its contents.

At operation we found an enormous hernial sac which had greatly widened the femoral ring, and was so large at its neck that the latter was closed with great difficulty after reducing the many coils of adherent small intestine which it contained. If I had not employed the inguinal route to secure access to the neck of the sac the operation would have been not only extremely difficult, but accompanied by the danger of injury to the many coils of intestine which were adherent to each other and the

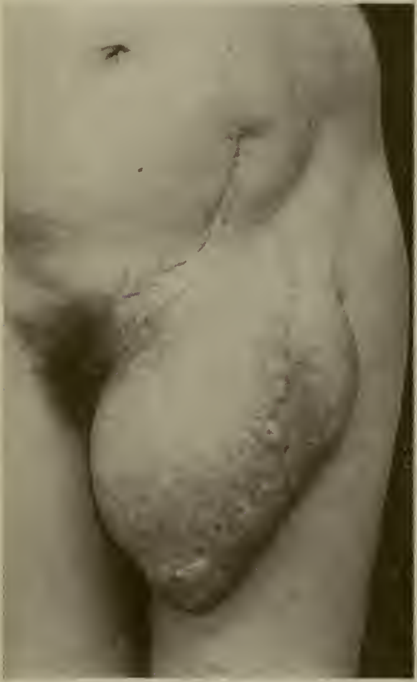

Fig. 18.—Front view of large recurrent femoral hernia.

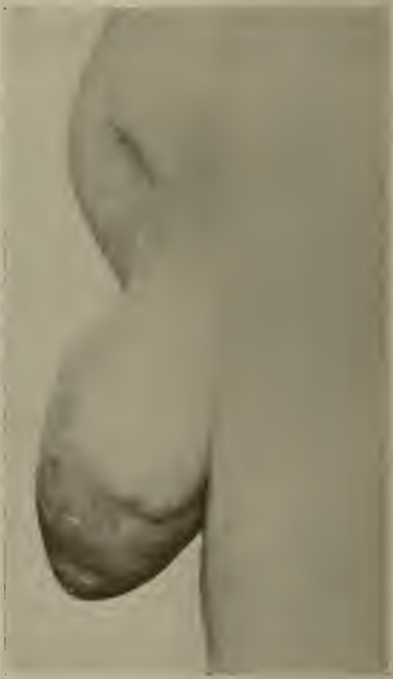

Fig. 19.—Side view of same patient shown in Fig. 18.

walls of the sac. Not only was the neck of the sac rendered more accessible, but the closure of the femoral ring was made a comparatively simple task by approaching it from its inner aspect. The Moschcowitz method, if it had been employed when she first entered, might have made primary intestinal resection and

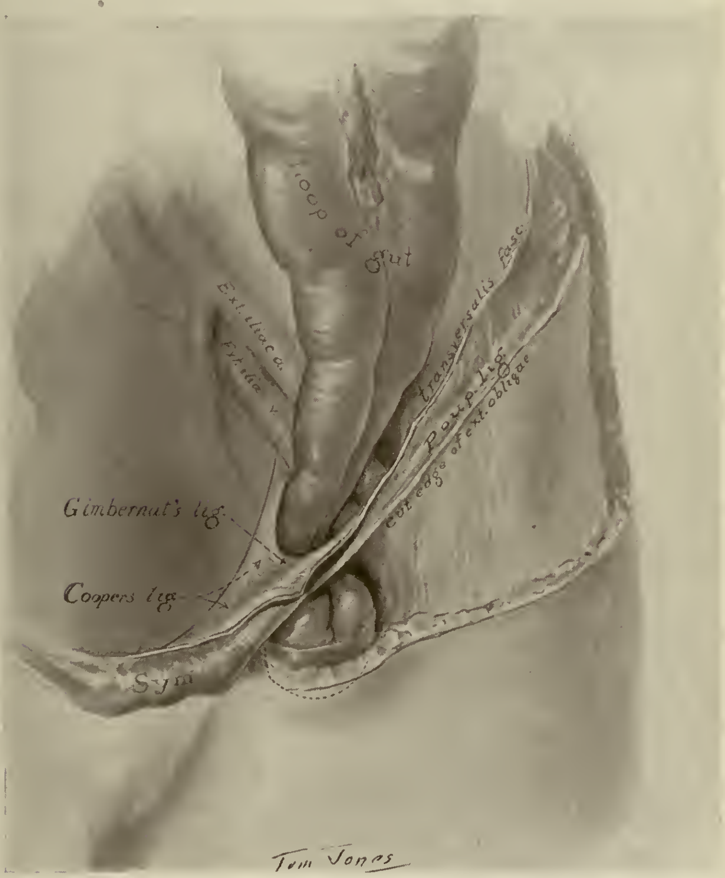

Fig. 20.—Topographic relations in femoral hernia (after Seelig and Tuholske). Note location of Gimbernat's ligament on the inner, of Poupart's ligament on the upper, and of the femoral vessels on the outer sides of the femoral ring. This illustration shows the great advantage of the inguinal route over the old femoral route in securing access not only to the femoral ring but to the neck of the sac. (Compare with Figs. 21, 22, and 23.)

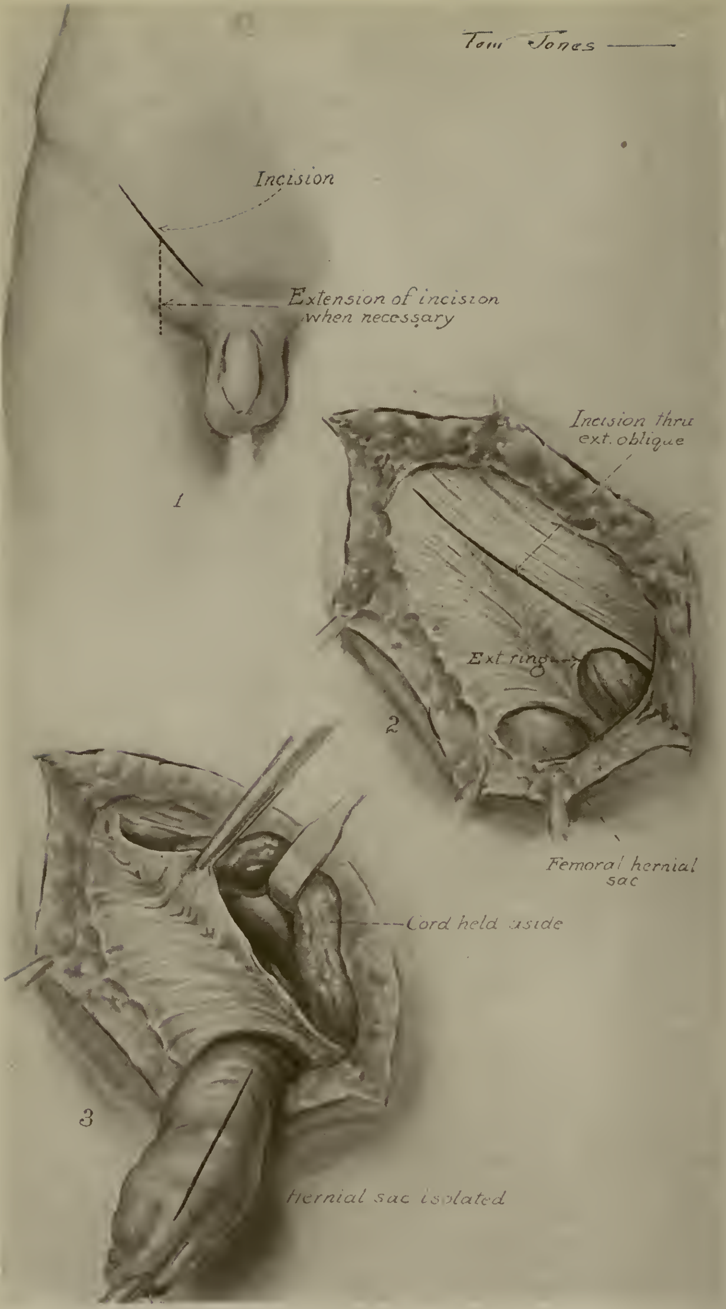
Tom Jones
Incision
Extension of incision
when necessary
1
Incision thru
ext. oblique
Ext ring
2
Femoral hernial
sac
Cord held aside
3
Hernial sac isolated

Fig. 21.

closure of the femoral ring possible without such complications as a fistula and an extensive recurrence.

Our third case is that of this young man of twenty-five who states that he has noticed a swelling over the right Scarpa triangle for the past three years. Examination reveals the presence of a typical reducible femoral hernia. I propose to operate upon this patient by the inguinal method of approach employed in the first two cases, and shall give you an opportunity to follow the technic step by step and note its many advantages.

Before beginning the operation let me ask you to recall the topographic relations of femoral hernia so well shown in this illustration made with some changes from the one in the article by Seelig and Tuholske, to whom I am indebted for calling my attention to the many advantages of the Moschcowitz method.

The sac of a femoral hernia protrudes from the transversalis fascia and parietal peritoneum close to the inner aspect of the femoral ring (Fig. 20). After entering the ring itself and the femoral canal, the sac and its contents (Fig. 20) are in close relation with Cooper's ligament[1] and the pubic bone behind, Poupart's ligament in front, the femoral vein on the outer side, and Gimbernat's ligament on the inner or mesial side. The sac then descends beneath Poupart's ligament in the space known as the femoral canal on the inner or mesial side of the femoral vein, and comes to the surface through the saphenous opening. The type of operation still employed by the majority of surgeons to repair a femoral hernia is to expose the sac by an incision over Scarpa's triangle, isolate and ligate the neck as high as possible

---

[1] Cooper's ligament is a thick fascial bundle covering the ramus of the pubis according to the investigations of Seelig and Tuholske (loc. cit.) and others.

Fig. 21.—1, Location of incision for inguinal access to femoral hernia. Incision can be extended in direction shown by the dotted line if dense adhesions exist between the hernial sac and surrounding tissues. 2, This shows incision through external oblique aponeurosis passing through inner pillar of external ring at its lower end. 3, Inguinal canal opened, cord held aside, and femoral hernial sac isolated. The dark line over sac indicates the incision made to examine contents of sac before latter is pulled up into inguinal canal.

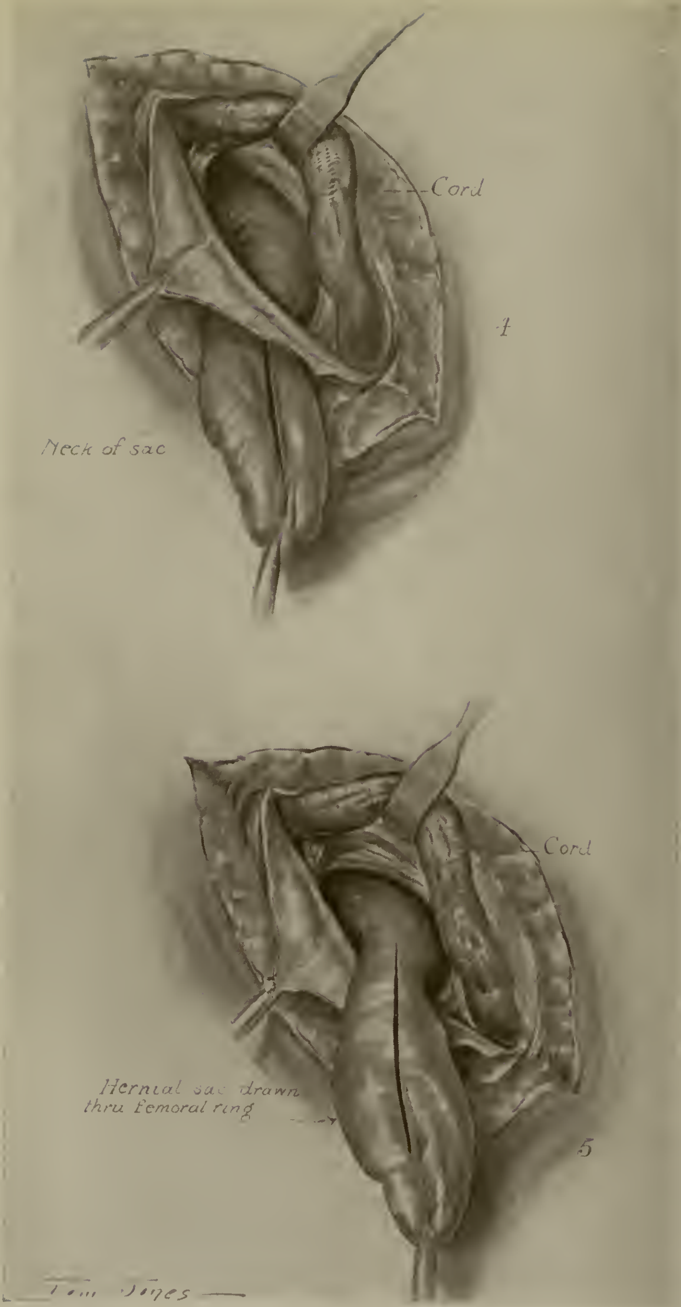

Fig. 22.

beneath Poupart's ligament, and close the femoral canal by approximating the pectineal and iliac fasciæ to Poupart's ligament. Ochsner makes no attempt to perform such a plastic, but believes that high ligation of the sac alone suffices. A glance, however, at Fig. 20 will show you the great advantage of an ample exposure of the femoral ring from the inner aspect, where it begins at the pubic arch. The aim of the Moschcowitz operation is to close this gateway or weak point by approximating the ligaments of Cooper and of Poupart.

Let us proceed with the operation in order that you may observe the details of the technic. Step one (Fig. 21): The inguinal canal is opened in the manner which we usually employ for repair of an inguinal hernia. I prefer to carry the incision which divides the external oblique aponeurosis through the internal pillar of the external ring, as this enables one to cover the cord more completely, in the last step of the imbrication method of Andrews (Fig. 21, 2) The canal having been opened and the spermatic cord, inner half of the external oblique, and the internal oblique held inward, and the outer half of the external oblique and skin-flap outward, we separate the sac of the femoral hernia from the adjacent fat, etc., of Scarpa's triangle (Fig. 22, 4). As a rule, this can be readily done without extending our incision in a downward direction (Fig. 21, 1) over the sac itself. Having freed the sac as high up as the femoral ring, we proceed to open the sac in order to note the character of its contents (Fig. 21, 3).

Step two: If the contents are easily reducible, only a relatively small incision in the sac suffices. In incarcerated or

---

Fig. 22.—4, Inguinal canal opened, cord held to mesial side, and neck of sac exposed. The fundus of sac is opened through an incision indicated by the dark line, and its contents, if any, reduced before the sac is pushed up through the femoral ring to be ligated at its neck. 5, The hernial sac has been drawn upward through femoral ring and is ready to be ligated at its neck where it protrudes from peritoneal cavity. This illustration shows the great advantage of the inguinal route for femoral hernia because it permits of ligation of the sac at its highest point, and also shows how the incision (indicated by the dark line), made to examine and reduce the contents of the sac, can be extended to the neck of the sac, permitting better access to adhesions of the omentum (Case III) and a larger field for reduction of incarcerated or strangulated viscera (Cases I and II).

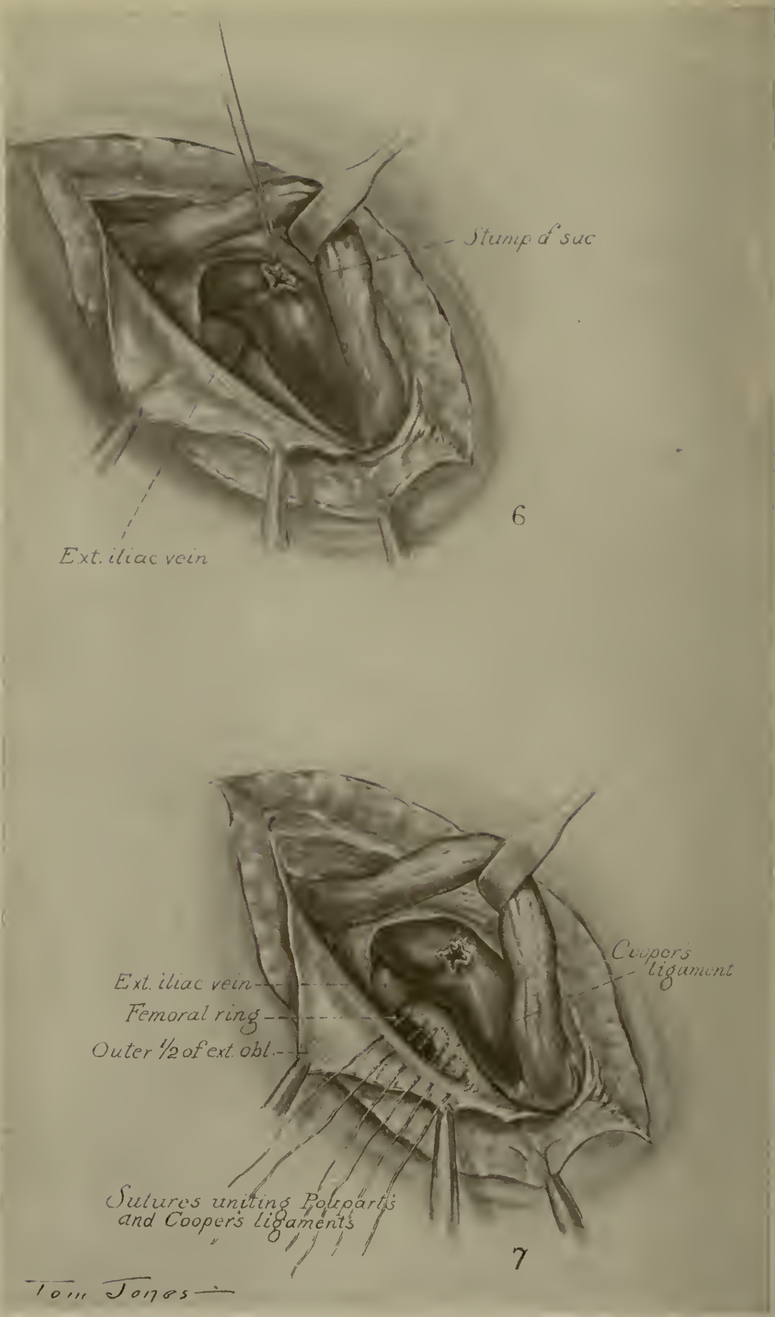
Stump of sac
Ext. iliac vein
6
Ext. iliac vein
Femoral ring
Outer ½ of ext. obl.
Coopers ligament
Sutures uniting Pouparts and Coopers ligaments
7
Tom Jones

Fig. 23.

strangulated cases it is advisable to extend the incision to the neck of the sac before pulling the latter into the inguinal canal (Fig. 22, 5). You can now see that the sac contains omentum which is densely adherent in the vicinity of the neck of the sac. The great advantages of this method of approach are self-evident. By extending the incision which we have made to open the sac to the point where it arises from the parietal peritoneum (Fig. 22, 4, 5) we are able to separate these omental adhesions without pulling the sac down and doing any damage to the tissues. In the first two cases this high exposure of the interior of the sac afforded a far better access to the point of constriction in strangulated or incarcerated hernia. One has far more space to do an intestinal resection than by the older method.

Step three: Having freed the adherent omentum at the neck of the sac, I will now pull the empty sac upward through the femoral ring (Fig. 22, 5) into the inguinal canal, and proceed to do a high ligation of the sac (Fig. 23, 6) after removing its distal portion.

Step four: We will now close the femoral ring by having the assistant retract the external iliac vein outward. The inner aspect of the femoral ring is now exposed; we will obliterate it by three chromic catgut sutures, two of which pass through Cooper's and Poupart's ligaments and the third through Cooper's and Gimbernat's ligaments (Fig. 23, 7). There is no danger of injury to the external iliac vein because it is easily retracted outward, as you can see.

Step five: The last step of this operation is to close the inguinal canal either by the Bassini method or a modification known as the Andrews imbrication technic, which we prefer at

---

Fig. 23.—6, Final steps in femoral herniotomy by the inguinal route. Stump of sac ligated at its highest point. Note relation of external iliac vein on outer side of operative field. 7, After high ligation of the sac the femoral ring is closed by two or three sutures of chromic gut from its inner aspect. The sutures unite Poupart's and Cooper's ligaments. There is no danger of injuring the iliac vein, but as a matter of precaution it is well to pull it outward with a small blunt retractor. The third suture passes through Gimbernat's ligament.

this hospital. Whether or not the cord should be transplanted is, to a great extent, a matter of personal preference. I always transplant the cord, as one secures much better closure at the level of the external ring. We will close the skin in the usual manner and keep the patient in bed for ten days.

My experience with the Moschcowitz method has been a very satisfactory one, and I can warmly recommend it, especially in cases of strangulated or incarcerated hernias, or where there are extensive adhesions, as in our third case, between the sac and its contents which require adequate exposure of the neck of the sac. The closure of the femoral ring from its inner aspect is a far more accurate and rational procedure than the older method permits. High ligation of the sac can be done without any traction upon its point of origin from the parietal peritoneum.

CLINIC OF DR. KELLOGG SPEED

Cook County Hospital

PROLAPSUS RECTI

Summary: Pathology of prolapse of the rectum; clinical picture and diagnosis; demonstration of the principles of treatment in a case of complete prolapse of moderate degree; results.

This patient is J. K., a single, white male, forty years old, a laborer by occupation. Five years ago he noticed a pigeon-egg-sized protrusion from the anus after defecation. The protrusion could be reduced, but it always reappeared when he was constipated or when he strained at stool. In the five years intervening up to this time the mass has made its appearance often and has increased in size. For the last month the mass has become very troublesome and has not been reducible at any time. If the patient attempted to do heavy work or strained at stool severe pain in the anus followed. In cleaning the anus after stool a small amount of bright red blood appeared.

The patient has had pneumonia twice, once at eight and once at fifteen years of age; scarlet fever at ten years; arthritic attacks at twelve, nineteen, and thirty years, with involvement of multiple joints including the spine.

The main points in his present physical examination in addition to the rectal trouble are: right dorsal scoliosis with marked dorsal curvature of the spine; well compensated mitral regurgitation with moderate cardiac hypertrophy; slight pulmonary emphysema.

From the anal ring there protrudes a reddish-pink, rounded swelling, with corrugated surface much like healthy granulation tissue, but undoubtedly a mucous surface (Fig. 24). No ulceration is present. This prolapse is painful when the patient is erect, but eases if he lies down. He feels a constant desire for a bowel movement. Since he has been in the hospital his stools have been kept very soft or even liquid by means of magnesia, and he has been forced to use a bed-pan in a recumbent posture. We hoped to induce either spontaneous reduction of the prolapsed mucous membrane or reduction in size sufficient to enable the patient to reduce the mass manually and hold it reduced. We have not accomplished that. His urine has a specific gravity of 1012, an acid reaction, no albumin, and no microscopic findings. Two days ago he was given an average dose of castor oil and today is ready for operation.

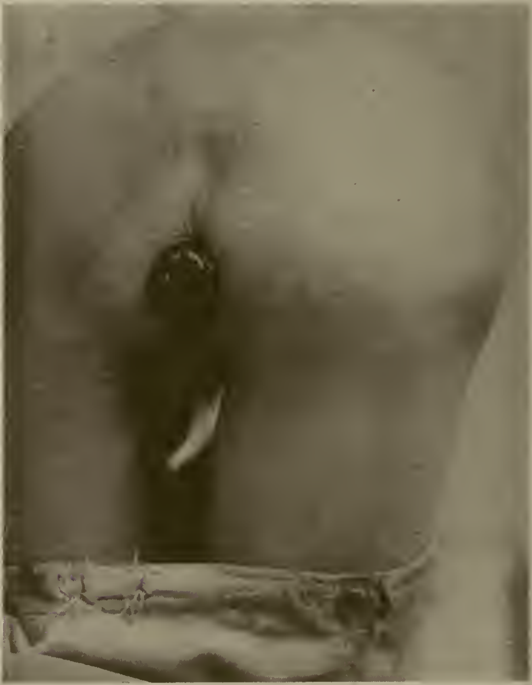

Fig. 24.—Irreducible prolapse of rectum of five years' duration.

We must consider the pathology of this prolapse before we can offer a rational treatment. The term "prolapse of the rectum" is used to designate all types and degrees of protrusion through the anal ring. There are two main groups: the incomplete or partial, in which mucous membrane alone descends

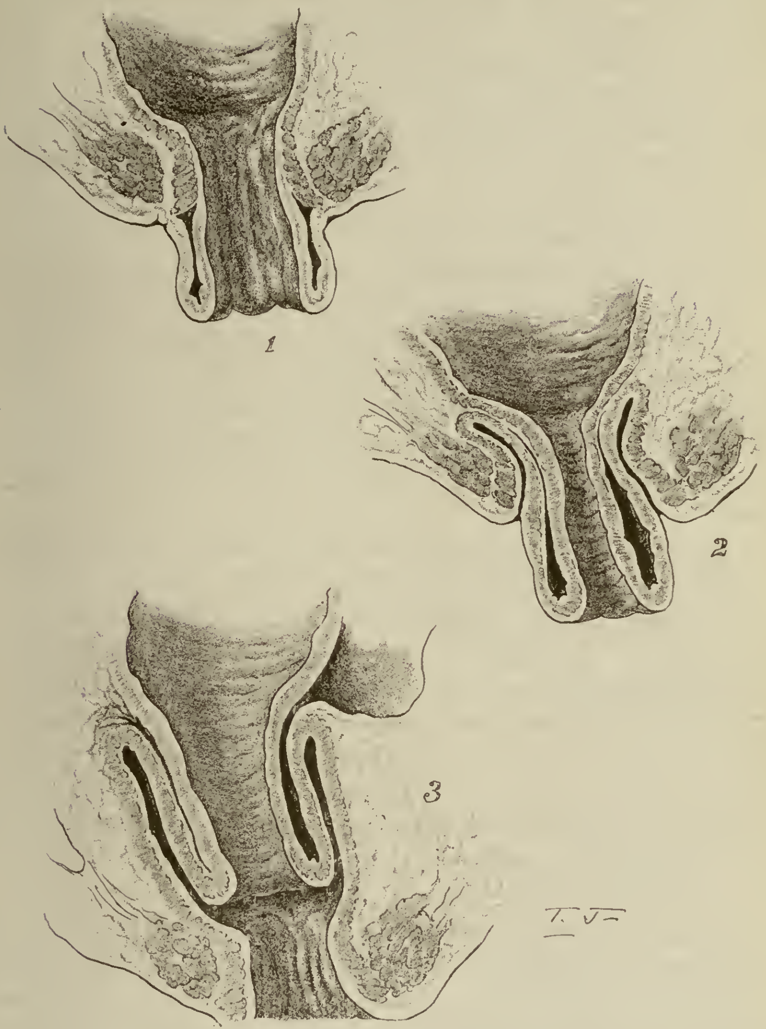

Fig. 25.—Types of prolapse: (1) Mucous membrane only is protruded; (2) all ths coats of the bowel are included; (3) the lesion remains within the ampulla, the condition being really one of intussusception.

(Fig. 25, 1), and the complete, in which all coats descend (Fig. 25, 2, 3).

Were it not for an intact powerful sphincter ani and its associated muscles we can easily see by watching the anal orifice during the act of defecation that prolapse would be a common ailment. With the sphincter relaxation and the letting down of the support of the levator ani in the normal act of defecation the mucous membrane of the anal canal rolls down and out into full view. If the loose submucous fibrous tissue loses its elasticity for any one of several reasons this extension of the mucous membrane quickly becomes an abnormal habit; it passes the elastic limit of the supporting base tissue and tends to stay out rather than draw back into its customary position. Any means of pulling on this relaxed mucous membrane becomes a contributing factor in the gradual development of prolapse; hemorrhoids, rectal inflammation, constipation, hard stools, rectal tenesmus from diarrheas or cathartics, tumors of any kind, foreign bodies, or even seminal vesical and prostatic inflammations are auxiliaries.

The natural sequences of this misplacement of the mucous membrane are: first, increased relaxation of the sphincter muscle, then edema of the mucous surface until anal control is lost and the extrusion cannot be governed by the will. It then tends to become irreducible and ulceration with bleeding follows as a late result. The whole circumference of the mucous membrane may not be involved; in a prolapse which is irreducible it usually is. The moist surface is at first smooth, but later becomes reddened and roughened like fresh granulations, on which existing hemorrhoids or ulcers may be demonstrated.

A complete prolapse involves all the bowel coats and may be of three types. In the second type we can always demonstrate a sulcus between the anal margin and the protruding mucous membrane (Fig. 25, 2). A third type is hidden within the ampulla and has no external sign, but may cause all the symptoms including pain and hemorrhage. This type (Fig. 25, 3) is really an intussusception of the rectum within the ampulla which cannot be easily detected even on digital and proctoscopic examination.

This patient presents no hemorrhoids on his extruded mucous membrane. There are no ulcers, and the slight amount of hemorrhage he has found after stools has come from the granulating surface. These longitudinal folds tell us that all the bowel coats are descended; if they were not, the mucous membrane would be smooth and taut. When I insert my finger into the rectum I find that the sphincter has not lost all its power; it still grasps slightly. I find no sulcus present between the anal margin and the prolapsed membrane, so we can consider this a complete prolapse of the first type of rather mild degree.

A relatively harmless and easy cure can be attempted here in spite of the fact that we have a complete prolapse. This same method of treatment can also be used for the incomplete type. It is hardly necessary with this relatively small protrusion and a sphincter which still has evident contractile power to attempt rectopexy; that is, the sewing of the posterior rectal wall to the deep tissues just below the coccyx. That treatment can be reserved for severe grades. If, after five years, this sphincter muscle retains some power we can prophesize that if it is given a rest and a half a chance it will return to satisfactory function when this mass is released from its grasp. Also, if the mass is no larger than it is after these years, it is probable that the submucous rectal wall higher up still holds, and sigmoidopexy is not indicated. Consequently, our treatment will be simple, and will involve two principles: first, removal of the extrusion from the sphincteric grasp so that that muscle may regain its tone and power, and, second, treatment of the mucous surface so that it will become adherent to its submucous anchorage and tend to stay fixed in reduction.

We will first sear this mucous surface in the direction of the longitudinal axis of the bowel with the edge of the glowing cautery knife. I make several of these linear cauterizations, always in the long axis, burning through the mucous surface to the deeper tissue and passing across both sides of this prolapsed fold (Fig. 26). When these burned lines are complete I reduce the extrusion into the rectum. When the eschar sloughs and granulation with cicatrization follows along each of these burned lines we may reasonably hope to obtain firm adherence of the mucous surface to its supporting tissues. In the meantine we must keep the extrusion reduced and in a normal position. No stricture of the lumen can follow because my burns have been in the long

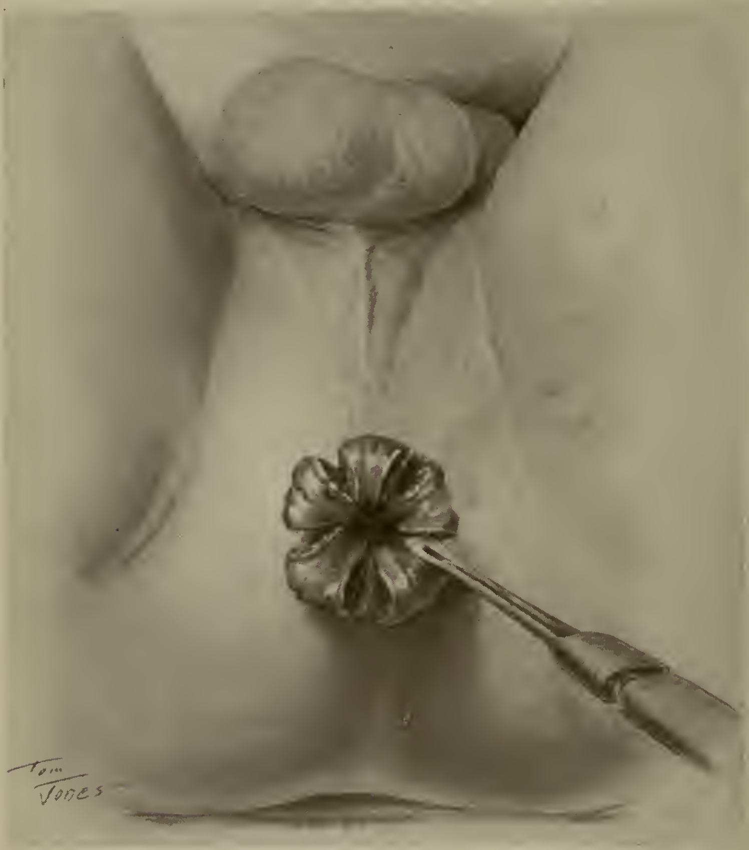

Fig. 26.—A method of treating moderate degrees of prolapse. The mucous membrane included in the prolapse is seared with the cautery as depicted above. Subsequent scar tissue retraction tightens the tissues sufficiently to prevent recurrence of prolapse.

axis, but the cicatrization will cause some tightening of the rectal lumen. We wish that. By reducing this mass and holding it back I accomplish the other part of my purpose. I remove it from the grasp of the sphincter, which can then regain its normal power.

After operation, if the patient were to pass gas or have a bowel movement or cough considerably, we might expect this extrusion to recur. To guard against that and to ensure my two essential points I shall sew up the anus. With a silk thread on a curved cutting needle, starting at a point near the median raphé, I pass a purse-string suture around the anus and draw it tightly. Now that is done, and you see I cannot pass even the point of a grooved director into the anal canal. It will take considerable intrarectal force to overcome that purse-string. This will remain in place a week. By that time the sphincter will have regained enough power to act as an efficient guardian to the outlet, the eschar within will have separated, and the cicatrization process will be started.

Night and morning the patient will be given 1 gr. of powdered opium by mouth and a constipating diet—a minimum of liquids and food with a minimum amount of residue.

Note.—This course of treatment was followed out. On the morning of the seventh day the purse-string suture was cut and removed. The patient had a medium-sized soft bowel movement, with no distress and no prolapse of mucous membrane. He had not been uncomfortable at any time during this confinement. For a few days he was kept in bed, given magnesia by mouth to keep the feces pasty, and compelled to use a bed-pan. After three weeks he left the hospital; no recurrence of the prolapse had followed, although he was then using the ordinary toilet. He has not reported at the hospital as requested to do if any of the old disturbance manifested itself. It was found before he was discharged that he was suffering from fibroid phthisis, with some indication of caseation changes in both lungs noted on *x*-ray examination.

CLINIC OF DR. GATEWOOD

PRESBYTERIAN HOSPITAL

STRICTURE OF THE ESOPHAGUS

Summary: Causes of stricture of the esophagus. Technic of the Sippy method of dilatation of esophageal narrowings.

THE patient whom I am about to show you came to me first a little over three years ago. At that time she weighed something under 100 pounds and was almost a skeleton. She is thirty-five years old. She said that she had accidentally swallowed some lye about two months previously. Her family physician, who accompanied her, told me that it had been taken with suicidal intent. Following this supposed accident she was able to take milk and liquids with very little difficulty, and after a few days even took some semisolid food. For the two weeks before admission to the hospital she was unable to swallow anything except a little water, and her physician resorted to the use of nutrient enemas. Her general condition was fairly good and the problem which confronted me was one of feeding. Her doctor anticipated an immediate gastrostomy. On account of the recent date of the "accident," I felt that we were justified in attempting to dilate the stricture before doing gastrostomy, and this was accomplished in a way which I shall describe to you later.

As the causes of esophageal stenosis have been fully considered by Dr. E. L. Moorhead in discussing esophageal obstructions in a recent number of the Clinics (Surgical Clinics of Chicago, June, 1919, p. 611), I shall simply outline them rapidly.

CAUSES OF ESOPHAGEAL STENOSIS

A. *Extrinsic:*
  - I. *Tumors of the neck,* as
    - Enlarged thyroid, retropharyngeal tumors, and carcinoma of the larynx.
  - II. *Mediastinal swellings,* as
    - (*a*) Tuberculous spondylitis with abscess formation,
    - (*b*) Mediastinal infection, as peri-esophageal abscess, tuberculous lymphadenitis, etc.,
    - (*c*) Tumors, such as Hodgkin's disease and lymphosarcoma,
    - (*d*) Aneurysm of the aorta, and
    - (*e*) Pericardial effusions.

B. *Intrinsic:*
  - I. *Congenital*—rare.
  - II. *Acquired:*
    - (*a*) Simple or benign:
      1. Cicatricial, due to swallowing of corrosives.
      2. Due to healing of a gastric ulcer at the cardia, or of an esophageal ulcer.
      3. Inflammatory—tuberculosis or lues (very rare).
      4. Esophageal diverticula and benign growths, such as polypi.
    - (*b*) Malignant—epitheliomata.

There was, of course, no difficulty in making a diagnosis in this case. It was an organic stricture of cicatricial origin, due to the swallowing of lye. Next to carcinoma, cicatricial narrowing due to corrosives causes the greatest number of esophageal obstructions.

There was no great difficulty in gradually dilating this rather recent stricture until an olive-tipped bougie the size of a No. 32 French sound could be passed. At this point she was sent home with instructions to her family physician to continue the dilating up to 38 or 40. She was able to eat soft food when she left the hospital and gained weight rapidly.

After dilatation to 40 or above has been accomplished, the patient is able with ordinary care to eat all types of food. Most of these strictures require an occasional dilatation for years, though once in six months is usually often enough to prevent trouble, and I have seen cases go for a much longer time without any evidence of recurrence of the stenosis.

The method of dilating an esophageal stricture which I employed three years ago in this case is the one which I intend to demonstrate this morning. It was developed by Dr. B. W. Sippy after a great deal of study and much experimentation, and is in many respects the best method I know of. Various methods have been employed since the time of Hippocrates, but until recent years all have depended upon the use of a blind bougie. In very tortuous strictures, such as the one we have here, and in those old strictures in which a marked dilatation of the esophagus has occurred above the stricture, this method frequently encounters insurmountable difficulties. Numerous false passages and perforations with resultant mediastinitis have followed the use of the ordinary bougie. If flexible bougies were used to avoid the danger of perforation, they frequently curled upon themselves without penetrating the stricture.

In recent years a number of methods have been devised and used with considerable success. Bircher has reported 2 cases of stricture of the lower end of the esophagus successfully treated by excision, bringing down from 4 to 7 cm. of the esophagus into the abdomen and connecting it with the stomach. I might add that Bircher believes that this is the only successful method by which a portion of the esophagus can be removed. The current literature contains records of a number of attempts to resect the esophagus for carcinoma, but, with the exception of those low down, in which the Witzel or a similar method of closure has been used, all have resulted fatally. Such operative procedures must necessarily be attended by a high mortality, and they should be reserved for malignant strictures in which there seems to be hope of accomplishing permanent cure.

In cicatricial strictures dilatation can be accomplished by the persistent use of some type of intra-esophageal bougie. Arrowsmith advises dilatation under endoscopic control. He reports a case in a two-and-a-half-year-old child in which there was a perforation of the esophagus just below the bifurcation of the trachea. This had been made by blind bouginage and would not have occurred had the Sippy method been used. It is occasionally necessary in small children to use the esophagoscope for the purpose of finding the stricture, but not for the purpose of dilatation, as usually advised. The great objection to dilatation under endoscopic control is that frequently there are several strictures, and it is necessary to dilate the upper one sufficiently to allow further introduction of the instrument before those below can be touched at all. Most patients do not anticipate esophagoscopy with delight, and since a safe method which is much more comfortable is at our disposal, it should be used.

Many men have reported methods by which dilatation was accomplished from below through a gastrostomy opening. In most of these cases a wire or a thread has been used as a guide. If this guide can be introduced from above, the entire problem is much simplified, and that is what we have done in this case. This patient, as you see, has a fine silk thread coming from her mouth. She started to swallow it two days ago. I have never seen an adult with a stricture so tight but that a fine thread (Corticelli C silk) could be swallowed if the patient would persist in the attempt. The thread will go through any stricture through which water will pass. Several inches of it can be made into a candy pill or put within a capsule and swallowed for the start. I have seen thread swallowed by children four or five years old. This thread has been marked at yard intervals, and from the four markings here I know that she has swallowed approximately 4 yards of string. It passes down into the intestine and becomes anchored; 3 yards is usually enough, but 4 is a little better. I have been asked if this is a safe procedure. I have seen many patients swallow such a thread and have yet to see any ill effects from its use. It soon passes out through the rectum after it has served its purpose. You will notice as I pull upon the thread that it gives a little, but that it is well anchored in the bowel. Where the stricture is not very tight, we use a No. 8 or No. 12 woven silk thread, as it is much less likely to break and delay the dilating. Formerly olive-tipped bougies were threaded over this string as a guide and dilatation accomplished in a fairly satisfactory manner. A stiffer guide has been found to be much better, and we are using this piano-wire with a small eyelet welded to its end.

Having first measured off 22 inches, the distance from the teeth to the pylorus, so that I will be sure that I have entered the stomach, I am introducing the wire over the thread. Keeping a little tension upon the string, the tip of the wire slides readily along until I come to the cardia, where I meet with slight resistance before entering the stomach. This tells me the location of at least one stricture, and also that it is a very narrow one. Where the stricture is so tight that as small a tip as this will not pass it is necessary to get a smaller eyelet, but except in a very small child this one usually will suffice.

Having now removed the wire guide, I am going to try to dilate the stricture with a No. 18 bulb. These bulbs are all stamped according to their size and correspond to the French sounds of the same number. I am screwing the blunt end of this bulb on to this flexible spring obturator. Reintroducing the wire about as far as I had it before, I have little difficulty in pushing this bulb along the wire into the stomach. The tip of the wire will not allow the bulb to pass over it, and enables me to withdraw the obturator. From now on we must use more caution, as we know the exact dimensions of the stricture and we do not wish to make any trauma. If the patient complains of much pain at any time it is well to postpone further dilatation until another sitting. In order to accomplish a gradual dilatation, as we use larger bulbs, it is well to use several at the same time, each a little larger than its predecessor. You will also notice that I have placed two bulbs of smaller caliber with their noses in the reverse direction. This will give me the same sort of a cone when I withdraw my dilators that I have as I enter the stricture from above (Fig. 27). This may not seem very essential at first glance, but I have seen a bulb stuck in the stomach for more than an hour while the operator used every means he could think of to remove it except gastrostomy. We shall be satisfied with No. 24 today, as this last effort required considerable force and caused the patient some discomfort. Besides, there is a little blood on the bulbs. One cannot deny the risk of rupture of the esophagus, but I have never seen it happen in benign strictures. It occurred to me once while

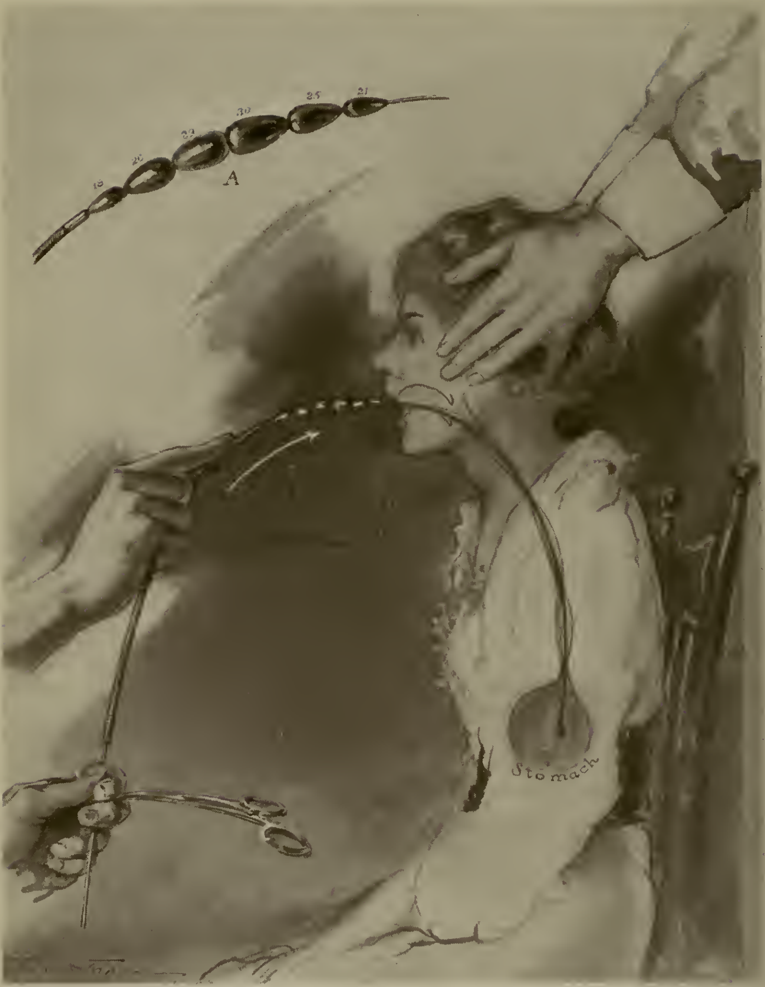

Fig. 27.—With the thread, swallowed several days previously, as a guide, piano wire is passed through the stricture into the stomach; olive tips are then threaded on the wire to form a spindle-shaped dilator, the largest tips in the middle and the smallest at each end, and are forced through the stricture by means of the flexible, spring bougie which is also threaded over the wire. The stomach end of the wire is enlarged so that the olive tips cannot be forced over it. When the piano wire is withdrawn from the stomach the tips are carried out on it. *A*, Arrangement of olive tips to form the most efficient dilator.

dilating a carcinoma of the esophagus, but not until after I had dilated the patient at intervals for more than a year after he first came to me unable to swallow anything except a little water.

When shall I repeat this process? That will depend upon the amount of soreness the patient has tomorrow and the general reaction in the way of temperature and pain. In all likelihood, there will be little of either, and I will be able to pass No. 26 or No. 27 two or three days from now, and will continue to repeat this process until I can pass No. 40. From my past experience I know that I shall encounter two other strictures not as tight as the one I have dilated today. One of these is at the bifurcation of the trachea and the other is a little below the junction of the pharynx and the esophagus.

This patient remained well for a considerable time after she went home three years ago, but during the past spring she became despondent and allowed her stricture to close. About the same time she developed influenza, and on account of her general condition the local physician deemed gastrostomy imperative, and since then she has been fed almost entirely through a gastrostomy tube. Her general health is better than when she came to me three years ago, and we should be able to dilate her so that she can again eat in the normal manner. It will be necessary to dilate her once in three to six months for a long time, and possibly the remainder of her life, but this entails no great hardship if she does not allow the stricture to become too tight. I have known working men with this affliction to continue their usual duties, and one of them has not been dilated now in nearly two years.

DISLOCATION OF THE HIP WITH FRACTURE OF THE ACETABULUM

Summary: Diagnosis of dislocation of hip; technic of reduction; postoperative management; mechanism of dislocation.

I SAW this patient for the first time a little less than an hour ago. He is a physician about forty years old. He told me that he was riding on the rear end of a truck when a man on a second truck held up a book which belonged to him. Recognizing the book, he signaled to the driver of the first truck to stop. The patient then jumped off and started for the curb. In the meantime the second truck also turned toward the curb and struck the patient, knocking him down. He fell squarely between the front wheels and would not have been injured at all had not the housing of the differential on the rear axle caught him. As nearly as the patient can recall he was struck on the outer aspect of the right thigh. He thinks his right leg was drawn well up at the time. Following the accident he was unable to arise and was brought here as soon as an ambulance could be summoned.

When I saw him on the ambulance stretcher he showed little or no shock and was fairly comfortable as long as the thigh remained flexed. When I examined him I found that he was unable to straighten the leg and that any attempt caused a great deal of pain. The knee was strongly adducted and the foot was inverted.

The great trochanter pointed anteriorly. The iliotibial band was very much relaxed, and although the patient is quite stout I thought I could feel the head of the femur posteriorly. There was no evidence of other gross injury, but there was some tenderness over the crest of the ilium. Thinking that there might be complicating pathology, I immediately sent him to the *x*-ray department without transferring him from the stretcher. The deformity is, of course, typical of dislocation of the hip.

Let us now examine the roentgenograms. They confirm our diagnosis, but, in addition, reveal a rather interesting and unexpected condition. As you can see, there is a piece of bone, about 2½ cm. in its greatest diameter, separated from the pelvis. It seems that this must come from the edge of the acetabulum, though it is difficult to see the defect in the acetabulum (Fig. 28).

I shall proceed at once to reduce the dislocation, as the patient is a good operative risk and the strained position in which he must keep the thigh is becoming very tiresome. We will first arrange a cart top on this cot, as it makes a firm platform upon which we can work with greater ease than were we to place the patient upon the floor or upon an operating table.

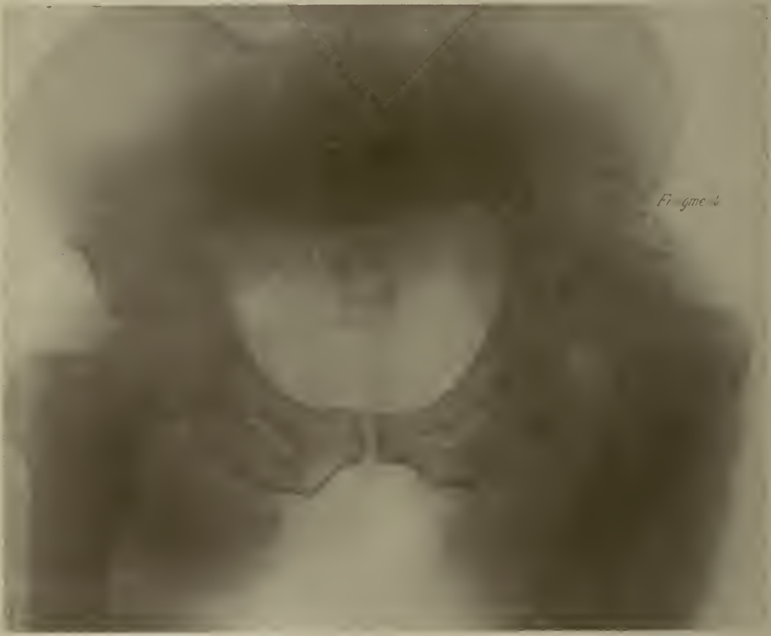

Fig. 28.—*x*-Ray picture of dislocated hip before attempt at reduction. Note bone fragments, probably from rim of acetabulum, overlying head of emur.

Ether is the anesthetic of choice, as good relaxation is essential to reduction, especially in a muscular man.

I will now attempt to reduce the dislocation by the direct method, that is, by a straight upward pull. My assistants are holding the pelvis firmly, the one on my left using his right hand to push the head of the bone toward the socket. As the man is quite muscular, it will in all probability require a considerable pull to reduce the dislocation. I find it easier to pull across my knee than to make a direct pull from the floor. As this attempt does not reduce the dislocation, I am adducting the thigh a little more in an effort to slip the head of the bone over the rim of the acetabulum. I will also make a slight rotatory motion anticlockwise at the same time (Fig. 29). The head is now slipping into the cotyloid notch. It is now in place. I have been very careful not to make a large circle in this rotation, as the sciatic nerve has been hooked up by this manipulation a number of times. Adduction relaxes the iliofemoral ligament and also aids in slipping the head over the rim of the acetabulum. I think that this has been of more benefit than the rotation, and probably a direct pull upward and slightly to the left would have accomplished the same result.

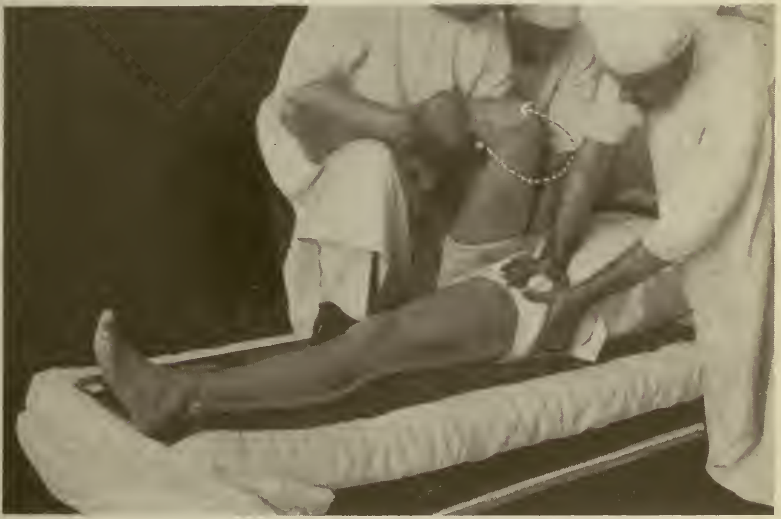

Fig. 29.—Reduction by traction and limited circumduction.

Very little is said in the text-books about the postoperative treatment of dislocation of the hip. In this particular instance I shall apply a plaster cast from the waist to the toes and keep it on for three or four weeks on account of the fracture. We can readily lift the patient by means of the cart top and place him on the Hawley table. This makes it very easy to apply the plaster spica. Just what has happened to the displaced fragment of bone the *x*-ray alone will tell. I am certain that it is not within the socket or reduction would not have been possible.[1] In my last case I also applied a cast for a short time, but allowed the

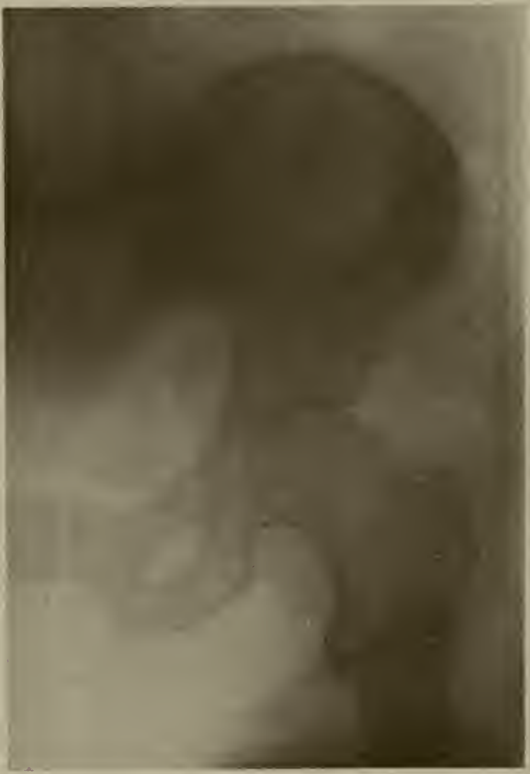

Fig. 30.—*x*-Ray picture taken the day following reduction. The position of the head of the femur is satisfactory; the fragment of bone seen in Fig. 28 can no longer be outlined and has doubtless been replaced in its natural position.

---

[1] In the *x*-ray plate taken the next day the fragment could not be outlined. It was evidently attached to the capsule and was replaced when the dislocation was reduced (Fig. 30).

patient to walk almost immediately. There is no great tendency to displacement, and were it not for the fracture a cast would not be necessary. Most men recommend rest in bed for about three weeks in the ordinary dislocation, but I have seen no bad effects from early walking, provided care is taken to limit motion somewhat.

Practically nothing has been added to our knowledge of dislocations of the hip since Allis published his classical essay in 1896. He covered the mechanism of production thoroughly, as well as the various methods of reduction. It was he who first called attention to the possibility of hooking up the sciatic nerve by the rotation method of reduction. In considering dislocation of the hip it is necessary to remember that the iliofemoral ligament, or **Y** ligament of Bigelow, the strongest ligament in the body, is immediately above the acetabulum and attached to the intertrochanteric line on the anterior surface of the femur. It is almost never torn and effectually prevents dislocation in an upward direction. The ligamentum teres is of little service in preventing dislocation, though it was long supposed to play an important part. It is sometimes absent in man and is never found in the orang-utan. The importance of the cotyloid or, as Allis terms it, the "sucker ligament" is rarely appreciated. It acts partly as a cushion and at the same time deepens the socket materially. It greatly reduces the danger of fracture of the rim of the acetabulum. It also, through the aid of atmospheric pressure, makes it difficult to draw the head from the socket after all the ligaments have been removed.

The capsular ligament is reinforced by the iliofemoral, ischiofemoral, and pubofemoral ligaments, as well as by the attachments of the gluteus maximus, iliacus, and psoas magnus muscles. The weakest point in the capsule may be readily demonstrated by injecting the joint cavity. It is below the pubofemoral ligament and opposite the cotyloid notch, or in the lower anterior part, and it is here that we must expect most of the dislocations to occur. From a casual examination of the ligaments about the joint it appears, therefore, that all dislocations are either anterior or posterior. Allis states that fracture of the rim of the acetabulum is extremely exceptional and makes no mention of it in describing the various dislocations with methods of reduction.

Dislocation can occur either by abduction or adduction. If the thigh is forcibly abducted the adductor muscles rupture, and, the force continuing, the head is raised out of the socket by the lever action of the femur as its neck strikes the rim of the acetabulum and the greater trochanter the ilium above. In this manner the head is thrown forward with a resultant thyroid dislocation. Should the thigh now be flexed and rotated inward, the head will follow around the edge of the acetabulum into the dorsal position, making a posterior dislocation. If the thigh be flexed and adducted, the angle of the neck and shaft prevents any bony fulcrum forming. If, however, the shaft is strongly rotated inward, the **Y** ligament of Bigelow becomes tense and is wound about the neck of the femur. In this way it acts as a fulcrum and the shaft revolves upon its axis, and as the head follows outward it presses against the lower posterior or weakest part of the capsule. This rupturing produces a posterior dislocation. Allis does not believe that a straight backward force can produce dislocation without rotation, and a fracture of the acetabulum or femur seems to him the more probable. In this particular case it is difficult to analyze the mechanism of dislocation, but it seems to me that the thigh was strongly flexed and internally rotated at the time the direct force was transmitted from the housing of the motor truck, thereby forcing the head directly backward and breaking the rim of the acetabulum at the same time. With this conception of the mechanism of the dislocation in mind, I have attempted reduction, that is, I have simply reversed the force.

Postoperative Note.—The patient walked into my office six weeks after the accident with perfect function of the hip and he has now resumed his usual strenuous work. He does not have any pain.

CLINIC OF DR. PHILIP H. KREUSCHER

Mercy Hospital

CARCINOMA OF THE ESOPHAGUS: GASTROSTOMY

Summary: Diagnosis of carcinoma of the lower portion of the esophagus. Gastrostomy as a therapeutic measure—when indicated. Technic of gastrostomy—postoperative management. Direct treatment of carcinoma of the esophagus with radium.

This patient, Mr. G., aged fifty-four, came for examination because of inability to swallow solid food. For fifteen or twenty years he has chewed tobacco to excess and smoked three or four cigars daily. He has been married twice; both wives died of pulmonary tuberculosis.

About eight months ago the patient first noticed some difficulty in swallowing solid food. Liquids and soft foods passed into the stomach without any distress. In the course of a meal solid food when mixed with liquids or when immediately followed by liquids would pass through into the stomach without regurgitation. In the last six weeks he has found that at times he was unable to swallow thick gruels or cereals. He has not eaten any solid or semisolid food for ten days. Thin, strained soup or cereal, and especially orange-juice and lemonade can be taken.

The patient has lost 30 pounds in weight; 15 pounds in the last six weeks. There is no cough, hoarseness, or dyspnea.

The Wassermann test is negative. There is no evidence of tuberculosis or of enlarged bronchial glands which might cause obstruction in the esophagus.

From the patient's statement it would seem that the obstruction in the esophagus was rather high up in the throat. Bougies can be passed far into the esophagus without any obstruction. The skiagram shows an obstruction in the lower portion of the

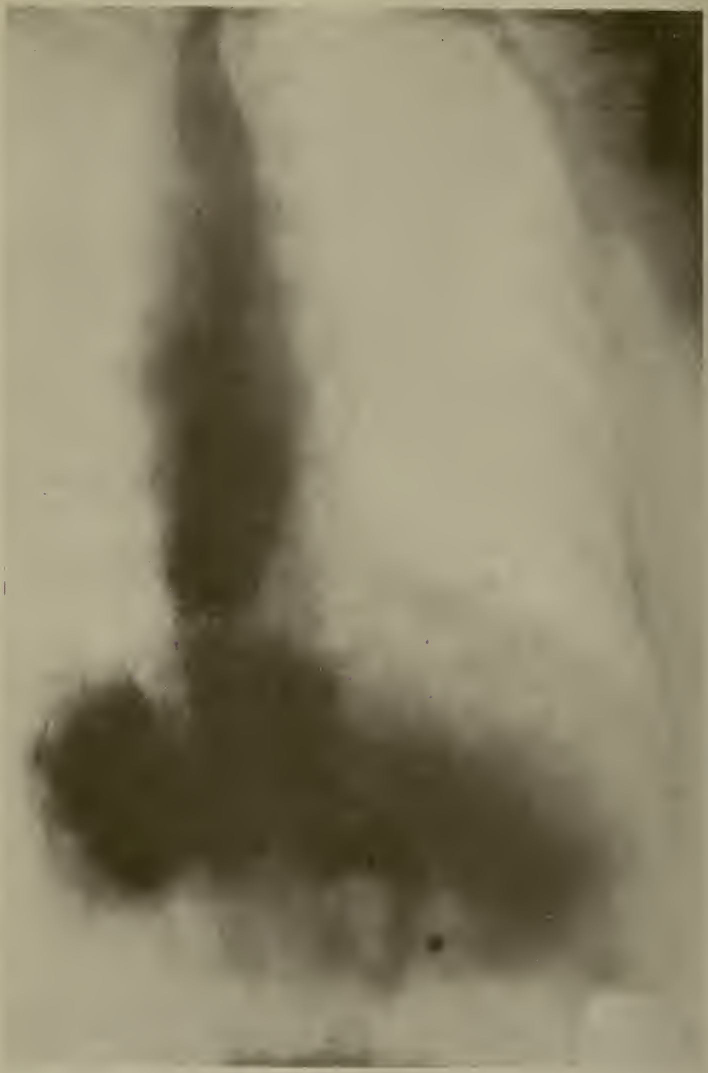

Fig. 31.—Anteroposterior view of esophagus filled with barium in suspension. Note the constriction just above cardia and thread-like line of barium passing into stomach. A small quantity of the barium has already escaped into the stomach.

esophagus and possibly some involvement of the cardiac end of the stomach (Figs. 31, 32).

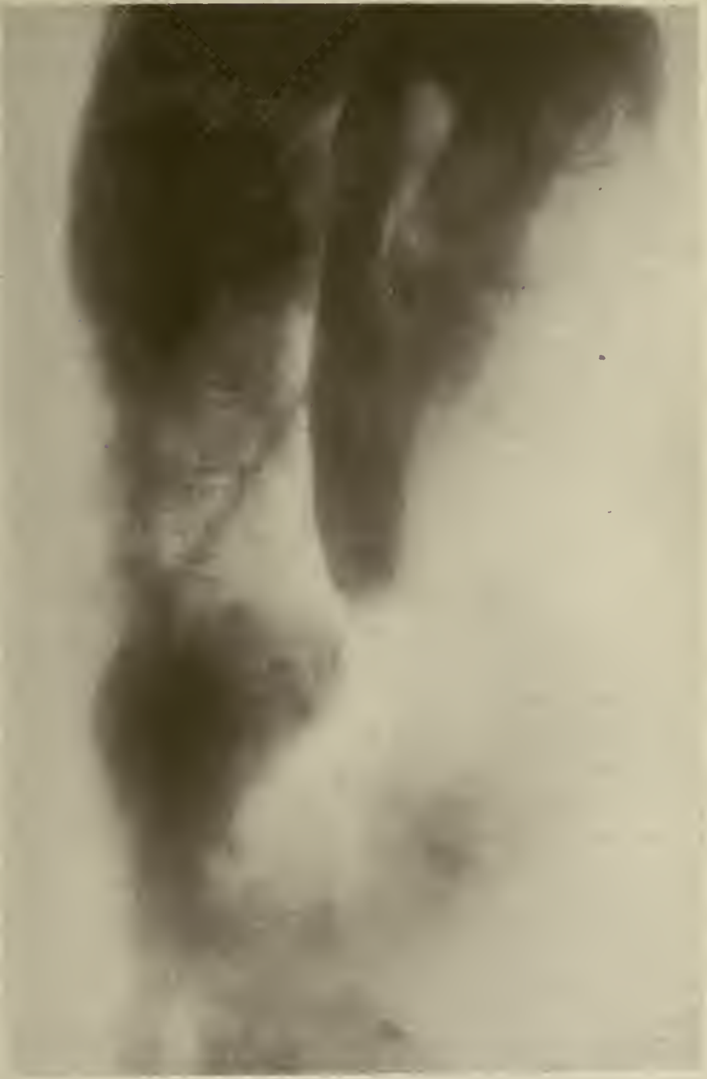

Fig. 32.—Lateral view of esophagus filled with barium in suspension.

We wish to make an artificial opening into his stomach so that he may be fed while the carcinoma is being treated. In the choice of operation, a number of which have been described, it is difficult to decide just which one is applicable for any given case.

In reviewing the literature one finds that Egeberg first suggested gastrostomy in 1837, but that it was first carried out by Sedillot in 1849. In 1875 Sidney Jones performed a gastrostomy operation and the patient survived for sixteen days, but Veneuil in 1876 had a patient to survive for sixteen months.

Survival following these operations, it seems to me, depends entirely upon the diagnosis. In cases of extensive carcinoma involving the cardiac end of the stomach one can readily understand why a patient should survive such an operation only for a few months. When this operation is performed for simple stenosis of the esophagus which does not yield to the ordinary bougie treatment, one would expect the patient to live for a great many years. The prognosis, I believe, has been greatly improved by the use of radium.

In the patient whom we wish to operate on for you now I would judge the cancer to be about the size of a small orange. From the fact that the bougie will pass with difficulty for about an inch and then stop entirely, and from the bleeding which takes place after such manipulations, one would be led to believe that the carcinoma involved a circumscribed area of the esophagus and had not penetrated into the surrounding tissues. Another point which must not be lost sight of is, that this patient has had difficulty in swallowing solid food only for the past three or four months, and the last two weeks has been unable to swallow anything except just very thin liquids. Although we were unable to obtain even the smallest particle of tissue for microscopic section, the diagnosis and indication for gastrostomy are very clear.

This operation was in disrepute for a long time. First of all, because surgeons did not recognize the condition or because the patient did not insist upon treatment. The patients were so frequently satisfied to live on liquids and soft foods because they believed, or they probably had been given reason to believe, that the spasm or constriction would subside after a time. This procrastination on the part of the patient or surgeon has brought many late cases into the operating clinic. The patient dies shortly after operation and the surgeon becomes discouraged because he has not been able to prolong the patient's life sufficiently to warrant operation in the next case which comes under his observation.

Gastrostomy has not been done frequently because of the fatal accidents which occur following it, viz., leakage from the stomach into the free peritoneal cavity causing peritonitis and death, or leakage of the stomach contents into the subcutaneous cellular tissues, with sepsis and occasionally death.

The improved technic, especially as outlined by Senn, Witzel, Frank, Kader, De Page, and others, has made the operation comparatively safe. The time for this operative procedure is *at once* after the diagnosis of carcinoma has been made, even before the obstruction has become complete. The operation, especially after the Senn method, is quite simple. Unless we find involvement of a considerable portion of the cardiac end of the stomach, we will follow this method, with a few modifications, in our operation today.

I am making a left rectus incision 3 inches long, dividing the fascia and grasping it in forceps. I then carefully split the rectus muscle, taking great care not to tear or free the muscle-fibers. I take this extra precaution not because of the fact that the fibers might not reunite and make a firm abdominal wall, but because of the fact that frequently mild infection takes place within the muscle sheath, and in that event any freed or partially torn muscle would break down and become necrotic. This incision, as you see, is made high up, beginning just at the costal margin, because we know that in most instances the portion of the stomach which we wish to expose lies in this area. We open the peritoneum, grasping it with forceps, and elongate this incision for a distance of about 2 inches, thus exposing the stomach. We bring it up into the field and make a thorough examination of the cardia, body of the stomach, and pylorus. There are no enlarged glands at the lesser curvature. There is no sign of malignant involvement of the pylorus. The cardiac end of the stomach is not involved, but reaching high up one feels a mass about the size

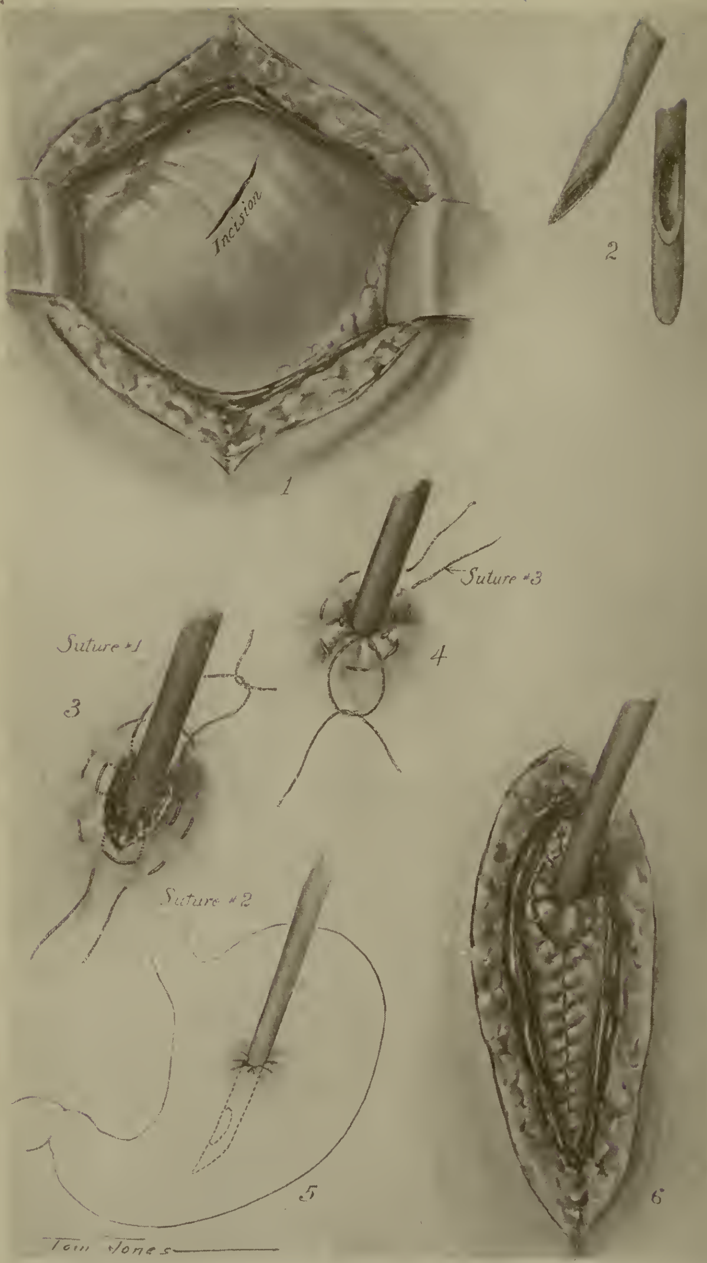

Fig. 33.

of an egg or a little larger, which is the tumor shown in the *x*-ray picture (Figs. 31, 32).

The site of election for gastrostomy, according to Senn, is between the greater and lesser curvatures and as near the cardiac end of the stomach as possible. Thus, without making undue traction, we bring the stomach up into the abdominal wound and proceed with our operation. You see I choose a point midway between the greater and lesser curvatures in this portion of the stomach and make my incision, after having first carefully walled off and protected the surrounding field (Fig. 33, 1). You see the stomach is empty. It has contained no solid food for several weeks and no liquids in the last twelve hours.

In order not to injure any more of the mucosa of the stomach than is necessary and in order not to perforate the stomach on the opposite side, I grasp the anterior walls with two large tissue forceps. I make an incision between these forceps. This brings me down through the various coats of the stomach to the mucosa. The mucosa is opened and grasped with rat-toothed forceps. The catheter which has been prepared for this operation is No. 14 and of fairly firm rubber. I use this in preference to a rubber tube because it has more stability and will not kink or be compressed as easily as the ordinary rubber tube. I prefer to cut off the blunt end of this catheter and make an additional opening or eyelet along the side of the tube about ½ inch from the end (Fig. 33, 2). If the large or oblique opening in this catheter should at any time lie against the posterior wall of the stomach, the food would still pass out through the opening on the side of the tube. The criticism one might make of this method of pre-

Fig. 33.—The stomach is brought up into the operative field and incised; note the relation of this incision to the greater and lesser curvatures; 2, the catheter is prepared with a large opening on the side to permit the entrance of food into the stomach cavity if the end should be occluded; 3, sutures in position. Note position of the knots for the various sutures; 4, the first suture tied and inverted and the second suture about to be tied; 5, the tube in position and the walls of the stomach inverted around the tube; 6, method of fixation of the stomach to the peritoneum. Note that the stomach is not attached to the rectus muscle or to the overlying rectus fascia.

paring the tube is that it gives you a pointed or rather rough edge which might irritate the gastric mucosa. You can overcome this very nicely by taking the tube and heating it over a flame until the sharp edges have become rounded and until the edge of the tube has become considerably softer than it was when we prepared it. After placing this catheter through the opening in the stomach I direct it toward the pylorus, introducing it about 1½ inches. Now I will place a purse-string suture of catgut around this tube. My needle carrying the catgut will penetrate all the walls of the stomach, and I will have at least ten such penetrations around this tube. Finally, I tie the catgut firmly around the tube, and then with an extra stitch through the tube and into the muscularis on either side fix the tube so that it cannot pull out until this catgut has been absorbed (Fig. 33, 2, 3).

Now by holding the stomach walls with these forceps an inch away from the opening we introduce two other purse-string sutures of linen (Fig. 33, 4). These purse-string sutures will not penetrate the mucosa. After the first purse-string has been placed in position I shall ask my assistant to make inward pressure on the catheter, thus invaginating the first catgut suture and pushing it into the stomach cavity (Fig. 33, 5). You will notice the knot of the first catgut suture was tied on the side of the tube nearest the cardia. My second purse-string has its knot on the other side of the tube directly opposite the first. The third purse-string will be introduced in such a way that the knot of this suture will be opposite that of the second, and a further inversion is made by pushing on the catheter in the direction of the pylorus. Thus having fixed the tube firmly in the stomach wall and having inverted a sufficient amount of the stomach wall, so that I believe there will not be any leakage, the next step is that of fixing the stomach to the parietal peritoneum (Fig. 33, 6). I will not bring the stomach into the abdominal wall as suggested by a number of operators. I believe if we can get good apposition here there will be no leakage into the peritoneal cavity and that the parietal peritoneum will be sufficiently strong to hold this apposition. Again, I am not desirous of interfering materially with the normal movements of the stomach. If this peritoneum where the stomach is attached will stretch without tearing and permit the organ to go back into its normal relationship and take on its normal movements, I will be very well satisfied. The tube is now brought up in the most convenient and direct position, being careful not to kink it. The muscle is not sutured, but simply drawn around the tube by suturing the fascia securely. You see that we have a rather direct line from without into the stomach, not having kinked our tube, and letting it come out at the upper angle of our skin incision. The skin is closed in the usual way with horsehair and two figure-of-8 silkworm sutures including the skin and incision line in the fascia.

AFTER-TREATMENT

Because of the fact that this patient has had so little real nourishment for at least six weeks I wish to supply him with the required nourishment immediately. We will supply liquids for the next three or four hours by the rectum, giving at first normal salines according to the Murphy drop method, and then after four hours a nutrient enema containing peptonized milk and egg. Six hours after operation he will be permitted to have liquids through the tube into his stomach. We will give him 2 ounces of peptonized milk and repeat that in two hours. The end of the catheter will be carried back into the dressings and closed with an ordinary hemostat or, what will be still more convenient, an ordinary screw clamp. Tomorrow the amount of each feeding will be increased to 3 ounces, and if there is no regurgitation or distress, it will be increased still more. Strained cereals and soups will be given on the third day, and by the end of one week the patient should be taking 8 ounces of nourishment of some kind every two hours. After a few days it will not be necessary to strain the soup or cereal and he will be given orangeade, beef-tea, and such nourishment as he may desire in liquid form. He will be up out of bed at the end of five or six days and will be taught to feed himself as soon as possible.

To quench the thirst and to have the patient enjoy his food as much as possible we will probably permit him to take orange-juice or soup or milk into his mouth. I doubt whether he will be able to swallow it, but the rule is that after gastrostomy the opening in the esophagus sometimes dilates a little and permits the patient to take water and very thin liquids without distress.

Note.—Three weeks after operation: The patient is now taking 8 ounces of liquids every two hours, consisting of plain milk and cream, soups, cereals of all kinds, and fruit juices. He has gained 3½ pounds in the last six days. There has been no infection in the abdominal wound and stitches have all been removed. Except for slight irritation of the skin around the tube there has been absolutely no discomfort.

The patient has now sufficiently regained his strength so that within a few days we will begin the treatment of the cancerous lesion. Under fluoroscopic inspection we will have a quantity of radium passed into the esophagus in approximation with the cancer in an effort to stop its growth, or, if possible, to decrease the size of the growth to such an extent that the patient will be able to take the different liquids by mouth rather than to be put to the trouble of passing them through the catheter.

CLINIC OF DR. ALFRED A. STRAUSS

Michael Reese Hospital

CONGENITAL PYLORIC STENOSIS

Summary: Diagnosis of congenital pyloric stenosis—supreme importance of fluoroscopy. Indications for surgical management. Operation—technic developed by Dr. Strauss; its superiority to the Rammstedt pyloroplasty. Postoperative care.

We have 2 cases of congenital pyloric stenosis for operation this morning. One is a patient four weeks old, the other a patient ten weeks old. Before operating on these patients I want to say a few words to you regarding the symptomatology, diagnosis, and etiology of congenital pyloric stenosis. I have operated on 101 cases of congenital pyloric stenosis, and if these 2 patients on whom I shall operate this morning survive the operation it will make a total of 103 cases with only 3 deaths. It is only fair to offer a word of explanation regarding these 3 deaths. The first death was in a child who was brought to the hospital pulseless and moribund, and on whom I operated contrary to the wishes of the attending physician, Dr. Abt, who believed the child would die in a few hours if left alone. In spite of this fact I operated on the child. The second fatality was a child in whom distention occurred on the fourth day after operation, the child dying on the sixth day. Necropsy revealed a partial intestinal atresia at the ileocecal valve with obstruction due to this anomaly. The third death occurred on the eighth day after operation. The child seemed perfectly well and was taking nourishment readily, when it suddenly became cyanotic and hemorrhages from the lung occurred. Necropsy revealed pulmonary embolism.

The 101 cases which I operated on were not selected cases. In none of the cases which came to us was operation refused;

32 of the patients were in a moribund condition. In these cases there was marked emaciation and the radial pulse was very feeble; 8 patients weighed less than 5 pounds each, and 4 weighed less than $4\frac{1}{2}$ pounds each; 4 were in such a state of decomposition that a semicomatose condition was present.

SYMPTOMATOLOGY

As to the characteristic symptoms and clinical findings, it will be noticed first that the patient has only slight vomiting at the age of ten to fourteen days. The vomiting gradually increases in severity until it becomes projectile in character. There will be constipation to a certain degree with green mucus starvation stools. On examining the abdomen one can readily see the peristaltic waves, the size of a small rubber ball, passing from the left hypochondriac region obliquely downward to the right side. These come at fairly short intervals and travel like typical peristaltic waves. Of course, these waves are much more noticeable if the infant's stomach contains some milk or water. If the patient is very emaciated a tumor can be occasionally felt in the right hypochondriac region, but this, I believe, is of secondary importance because the personal equation in palpating the tumor is a variable factor. The amount of emaciation of the infant depends upon the amount of obstruction that has been produced by the tumor rather than upon its duration or the age of the patient. I have seen a number of twelve-week-old infants who have had symptoms from the tenth day, but were still fairly well nourished. This, of course, was due to the fact that they had only a partial obstruction.

DIAGNOSIS

Regarding the diagnosis of this condition, I wish to state that fluoroscopic examination is the most important means of making an accurate diagnosis. It not only shows whether or not the case is one of pyloric stenosis, but decides for us immediately whether the patient should receive medical or surgical treatment. In the 156 cases in which we have employed fluoroscopic and *x*-ray examination, 101 were classified as surgical, and in each instance a tumor was found at operation. Of the remaining 55, which we classified as medical cases, not one has required surgical procedure to date, showing the absolute exactness of this method.

When a patient comes to us with a diagnosis of suspected congenital pyloric stenosis, we place the baby flat upon its back and allow it to take some sugar-water through a nipple. After $\frac{1}{2}$ to 1 ounce of water has been taken typical peristaltic waves will be seen running across the abdomen from the left hypochondriac region obliquely to the right. If you allow the child to take more water you will finally see the stomach balloon out and become tonically contracted. Then tremendous retroperistaltic waves can be noticed, followed by projectile vomiting. When the above features are noted we are almost certain that we are dealing with a case of congenital pyloric stenosis. To make absolutely sure we then take the child to the *x*-ray room and fluoroscope it, employing the following technic, which was worked out by Dr. Ahrens, our roentgenologist:

A small amount of bismuth is added to the mother's milk, and the child is placed under a horizontal fluoroscope. It is allowed to nurse the bottle while we watch the passage of bismuth-milk through the esophagus. If the child is permitted to lie flat on its back the bismuth-milk gathers on the left side of the vertebræ as a large round mass and will lie there indefinitely. If the baby is rotated to the right side, almost on its abdomen, we will see the bismuth gradually gravitate toward the pyloric end of the stomach, and peristaltic waves are immediately visible in the pyloric antrum and pylorus. A small amount of bismuth now squirts through, and then the pylorus clamps down tightly. Immediately, peculiar and characteristic, rhythmic, snake-like contractions can be seen in the pylorus, which are independent of the rest of the stomach. This is absolutely pathognomonic.

The fluoroscopic examination consumes only about two or three minutes at this time. The baby does not have to be undressed. At the end of two hours the child is again examined, and roentgenograms are taken. In some cases we have observed retroperistaltic waves in the body of the stomach with coincident dilatation of the esophagus. The latter condition is probably due to the retroperistalsis. The important fact that we have established in these examinations is that the contraction of the pyloric antrum and pylorus are absolutely characteristic. We have standardized the emptying time, so that any case in which one-half or more of the bismuth-milk remains at the end of four hours is recognized as a case of pyloric stenosis, and surgical intervention is indicated. The cases in which 80 per cent. or more of the bismuth has passed through the pylorus at the end of four hours can, as a rule, be cured medically.

I believe that this simple method of fluoroscopic examination produces no shock and gives an immediate indication as to the proper treatment. In my experience it has proved an ideal method of arriving at a definite conclusion. It is certainly much more accurate than aspirating the contents of the baby's stomach at frequent intervals, as suggested by Holt. With this method the stomach-tube frequently curls up in the cardiac end of the stomach, and nothing is aspirated, even though large quantities of food remain in the stomach. It cannot be denied that the constant passage of the stomach-tube has a markedly bad effect on these moribund infants.

In 21 of the 55 cases treated medically in which we saw peristaltic waves on the abdomen fluoroscopic examination showed that the emptying time was normal. Peristalsis would start high up in the stomach and force the food through the pylorus in a more or less normal manner. In these cases a similar hyperperistalsis could be noticed in the entire intestinal tract. In other words, we were dealing with a case of hypermotility of the entire gastro-intestinal tract. In the remaining 34 cases treated medically three-fourths of the bismuth had passed through at the end of four hours, though the characteristic rhythmic, snake-like contractions of the pylorus were noted. Because of this fact medical treatment was decided on, and all these patients recovered without operation. In 3 of the cases in which operation was performed there was preoperative vomiting, not projectile, and no peristaltic waves could be seen on the abdomen. Fluoroscopic examination revealed characteristic snake-like contractions and an almost complete obstruction. In each of these cases a tumor was found at operation.

To emphasize the importance of fluoroscopic examination I would like to cite a case which I was called to see a year ago last July with the object of operating on the patient. The patient had the typical clinical signs and symptoms of pyloric stenosis, was markedly emaciated, had large peristaltic waves, projectile vomiting, but was only moderately constipated. No fluoroscopic examination had been made in the case. When this examination was made it showed the bismuth-milk passing through the stomach in the normal time. I advised that the child be fed on mother's milk carefully and slowly and that no operation be performed. The child made an uneventful recovery. The baby grew large and robust, but nine months later developed pneumonia and died. Autopsy showed a pyloric tumor of fair size. However, there was an opening which allowed the passage of a No. 15 catheter. I think this case illustrates the importance of fluoroscopic examination. This child, barring the pneumonia, would undoubtedly have gone through life without trouble from his pyloric condition.

Palpation of the tumor is a matter of the personal equation. The tumor can be best felt while the child is asleep or nursing. We have paid very little attention to palpation of the tumor since we have worked out our fluoroscopic and radiographic technic.

To sum up: The diagnosis is made first by the characteristic peristaltic waves; second, fluoroscopic examination; third, projectile vomiting; fourth, emaciation; fifth, starvation; and sixth, palpation of the tumor.

ETIOLOGY

A great deal of speculation has been going on as to the cause of this peculiar condition in infants, and many hypotheses have been formulated. Since operating on these 101 patients I have come to some fairly definite conclusions which are based, first, upon negative experimental results in trying to reproduce this condition in animals; second, on clinical data, fluoroscopic and *x*-ray examinations; lastly, on observations at the operating-table.

In 1915 I attempted to reproduce this condition in newborn puppies by shelling out the mucosa and infolding it with fine fascial strips. Slight hypertrophy of the stomach wall resulted, due to the hypermotility produced by the obstruction, but no pyloric tumor developed. Later, I tried to increase the peristalsis by passing an electric current through fine platinum electrodes placed on the pneumogastric nerves, but this also failed to produce any tumor in these animals. Isolating the pyloric segment by cutting away a circular strip of musculature produced no independent peristaltic waves, and no tumor resulted. This experimental work demonstrated at least that the tumor formation was not due to the primary obstruction of the pylorus and that hypermotility of the stomach only produces slight hypertrophy of the wall, but no special tumor formation. I have not been able to formulate any form of experiment reproducing the snake-like contractions of the pylorus alone. If this could be accomplished I am inclined to believe a tumor-like formation could be reproduced, such as we notice clinically in this patient.

The dissection of these 101 tumors at operation showed that the tumor was absolutely proportionate in size to the age of the infant. This indicates that the tumor must be a progressive affair. Whether the muscular hypertrophy starts before birth in the uterus or at birth we are not absolutely sure, but we do know that Dent reported a pyloric tumor in a seven months' fetus and several investigators have found them in the newborn. I believe that the condition begins during the fetal development of the stomach and is brought about by rhythmic contractions of the pylorus, which doubtless start at that time and are due to abnormal stimulation from intrinsic or extrinsic nerves of the stomach. These independent rhythmic contractions of the pylorus produce hypertrophy on the same basis that any muscle that is in constant motion is hypertrophied. This condition of hypertrophy then must progress very slowly or hardly begins during fetal life. It becomes accentuated after birth owing to the additional irritation produced by the taking of food. The tumor gradually increases in size as a result of the rhythmic contraction of the pylorus, until at the age of seven to twelve weeks the tumors are four or five times as large as those found at three or four weeks. The size of the tumor, however, does not indicate the amount of obstruction present. That explains how a large tumor may be associated with very little pyloric obstruction and a small hypertrophy can produce an almost complete obstruction. I base my hypothesis on the fact that fluoroscopic examination has in many instances revealed these characteristic rhythmic snake-like contractions of the pylorus even though the child had vomited and the stomach was completely empty. It seems reasonable to conclude that the same contractions occur during fetal life and are accentuated at birth, thus producing a tumor which increases in size in proportion to the age of the patient.

OPERATION

The method of operation which I have employed in these cases is a pyloroplasty which I devised experimentally in 1912 and 1913. I was stimulated to perform this experimental work by Dr. Abt, who insisted that gastro-enterostomy, on account of its mortality, was not the proper operation for this condition. The pyloroplasty has as its object the transformation of the pathologic form of pylorus into a normal one. The pyloric tumor shows on cross-section that it has first an infolding of its mucosa and, second, a tumor composed of normally hypertrophied smooth muscle. In order to reconstruct this pylorus to normal we must unfold the infolding mucosa by shelling it out, and, second, reduce the muscle tumor by using it as a plastic flap.

The first patient that I shall operate on is four weeks old. In this patient we should only find a moderate sized tumor if our theory is correct as to the progressive increase in the size of these tumors with age. I now make a right rectus incision 1 inch in length, beginning in the right hypochondrium (Fig. 34, 1). This admits the index-finger and permits me to palpate the pyloric tumor, which feels about the size of a hazelnut. I now pass this fine ribbon-shaped hook into the wound along

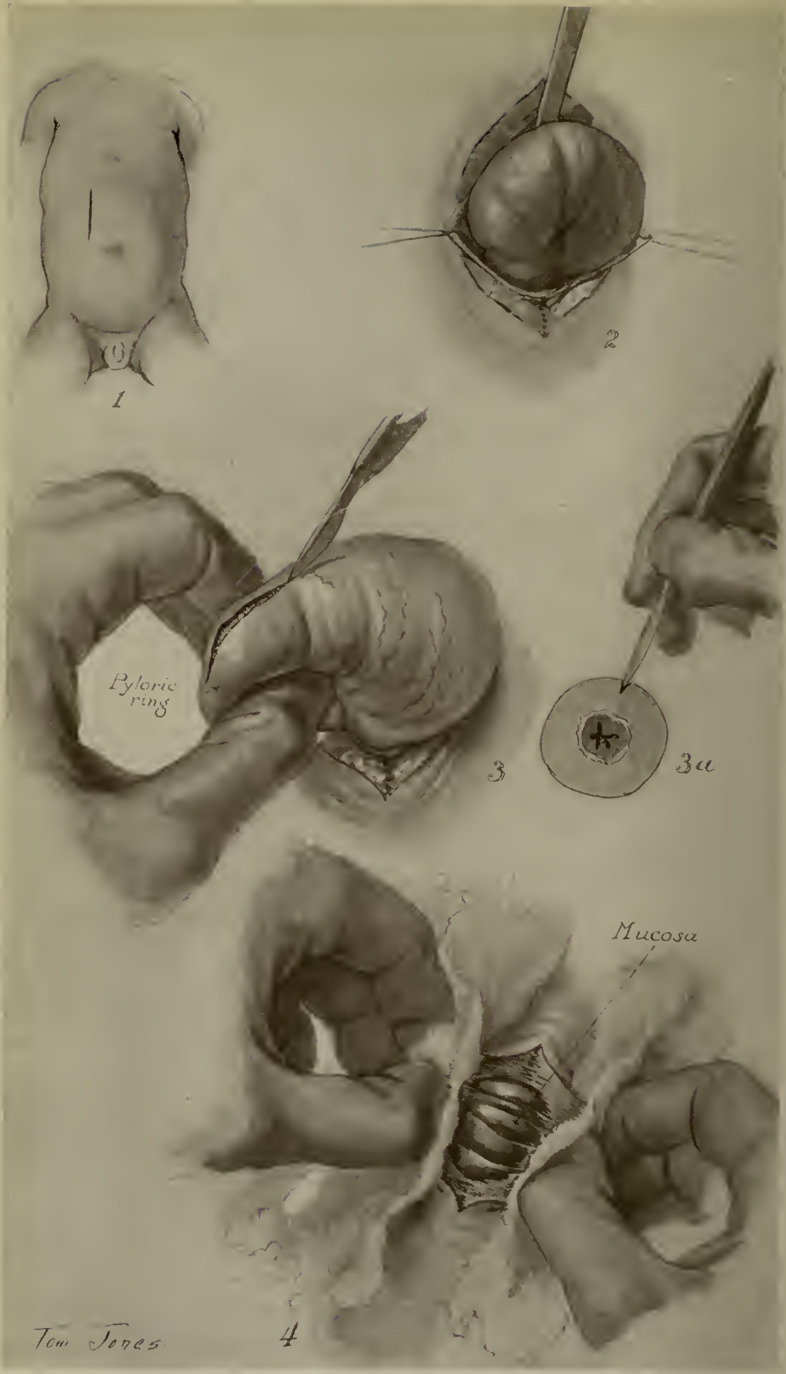

Fig. 34.

the index-finger to the tumor, which is brought up by means of this hook (Fig. 34, 2). This does away with handling or exposing any portion of the stomach except the pyloric end. On examining the pyloric region we can readily see the intermittent peristaltic contractions of the tumor which are independent of any contractions of the rest of the stomach. As you can now notice, the contracted tumor looks white and cartilage-like. Now it begins to relax and becomes pink and soft. This, I believe, bears an important relation to the etiology of this condition. I now make an incision over the more bloodless portion of the tumor, which, as you will notice, is the upper outer quadrant, starting well up on the normal side of the stomach and carrying it down almost to the duodenal end of the tumor (Fig. 34, 3). This incision is made with the sharp end of the scalpel, going through only the superficial layers (Figs. 34, 3, 34, 3, *a*). The rest of the tumor is now split with the handle of the scalpel on the stomach end of the tumor where it converges into normal stomach musculature (Fig. 36). By working through to the muscularis at this point with the handle of the scalpel a line of cleavage is very easily obtained, and the tumor can be readily split down to the duodenal end without the slightest danger of puncturing the mucosa. It is absolutely wrong to divide the tumor with a sharp scalpel down to the mucosa. This method accounts for the many deaths due to perforation of the mucosa when the Rammstedt operation is performed. I now grasp the edge of the split tumor with the thumb and index-finger (Fig. 34, 4) and spread it apart. This causes the mucosa to separate from the muscularis and also separates the few remaining fibers that remain near the duodenal end. You see every minute fiber down to the duodenum is now separated, which does away with the dangerous habit of trying to divide the muscle-fibers near the duodenum with the scalpel.

Fig. 34.—The abdomen is opened by a right rectus incision (1) and the pyloric tumor brought out by means of a blunt hook (2). The superficial layers of peritoneum and muscle are incised with the blade of the knife (3 and 3*a*), but the further dissection to the mucosa is made with the handle (Fig. 36). The flaps of muscle are turned out with the fingers, exposing the mucosa (4) and the mucosa shelled out.

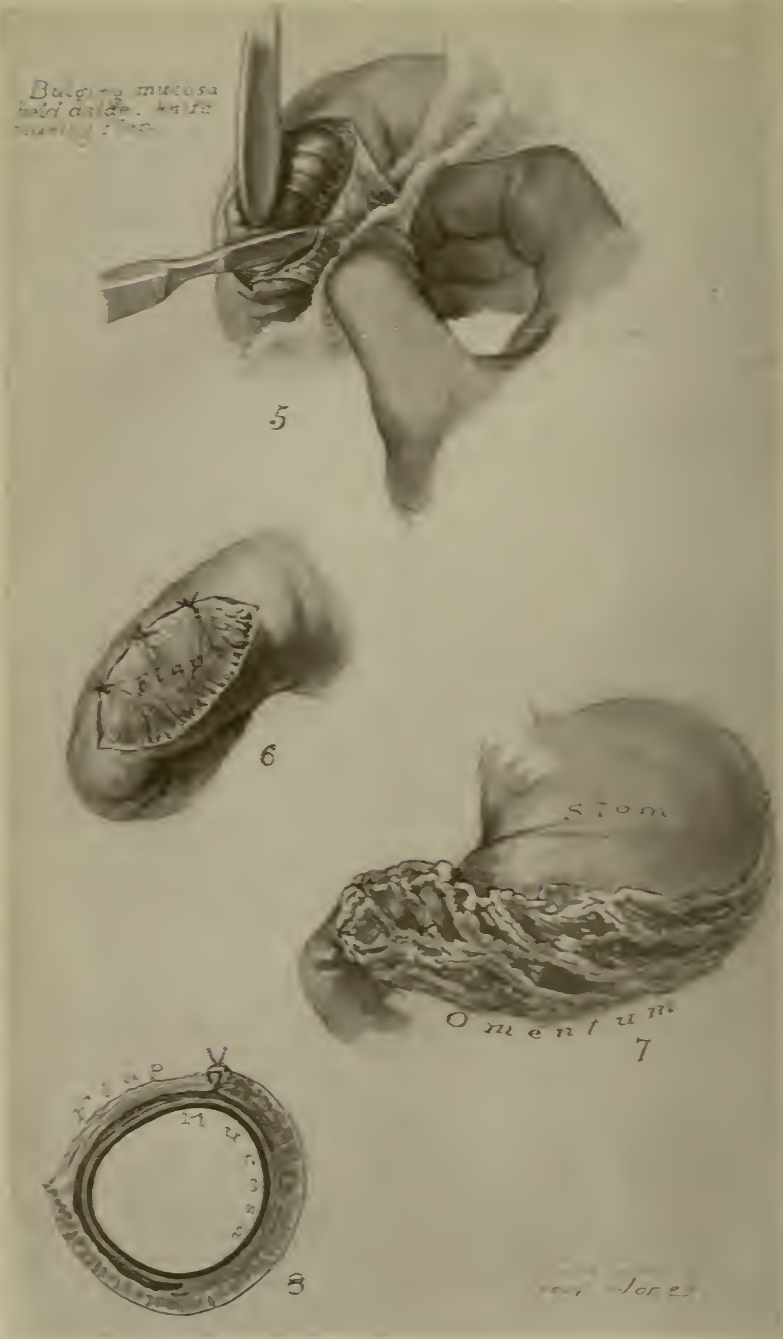
Bulging mucosa
held aside. knife
cutting flap
5
Flap
6
Stom
Omentum
7
Flap
Mucosa
8

Fig. 35.

Having established a line of cleavage from the separated mucosa I shell out the mucosa, beginning at the stomach side of the tumor. You will notice the mucosa shells out very easily by using a blunt Kocher dissector. This unfolds the infolding mucosa and also separates Meissner's from Auerbach's plexus, which is the first abnormal condition relieved.

The second step is to utilize the hypertrophied muscle tumor. This is accomplished by splitting the inner portion of the tumor and using it as a flap (Fig. 35, 5). I now turn this flap out and suture it over the shelled-out mucosa with three interrupted sutures (Fig. 35, 6). Thus, the pathologic pylorus is remodeled into a normal one. The free end of the attached omentum is now sutured with a few interrupted sutures of fine black silk over the operated area to cover the raw surface. This prevents leakage and hemorrhage, and at the same time gives a new blood-supply to the split muscle-fibers (Fig. 35, 7). (Figure 35, 8 is a transverse section showing the condition of the reconstructed pylorus.)

The time consumed in this entire procedure was only thirteen minutes. This operation has many advantages over the Rammstedt, the particular one being the reduction of the mortality, which ranges from 15 to 30 per cent. in the Rammstedt to less than 3 per cent. in this operation. Downes, the chief advocate of the Rammstedt operation, has a mortality of from 15 to 20 per cent. This high mortality is due to two important factors: either incomplete division of the muscle tumor, of which Downes and Lewisohn have reported cases, or puncturing the mucosa in trying to divide these fibers near the duodenal end. The second great advantage of my operation is that it affords immediate and complete relief. In the Rammstedt operation the mucosa is not shelled out, and as a consequence there is vomiting for a few days. The vomiting may be sufficient to cause death. By shelling out the mucosa a free passage for food is immediately

---

Fig. 35.—A flap of muscle is made by splitting one of the leaves of the incision (5) and is stitched over the bulging mucosa (6); this, in turn, is covered by omentum (7). (A cross-section of the condition as pictured in 6 is shown in 8. Compare with Fig. 36.)

established; there is no vomiting, and the child rapidly improves. This is undoubtedly an important factor in lessening the mortality rate.

It may be of interest to you to know that I recently operated on 3 cases of pyloric stenosis by the Rammstedt method. In these cases I did not shell out the mucosa, make a flap, or suture over the omentum. Our head nurse, who takes care of these infants and has taken care of all my operated cases of pyloric stenosis, did not know that I had performed a different type of

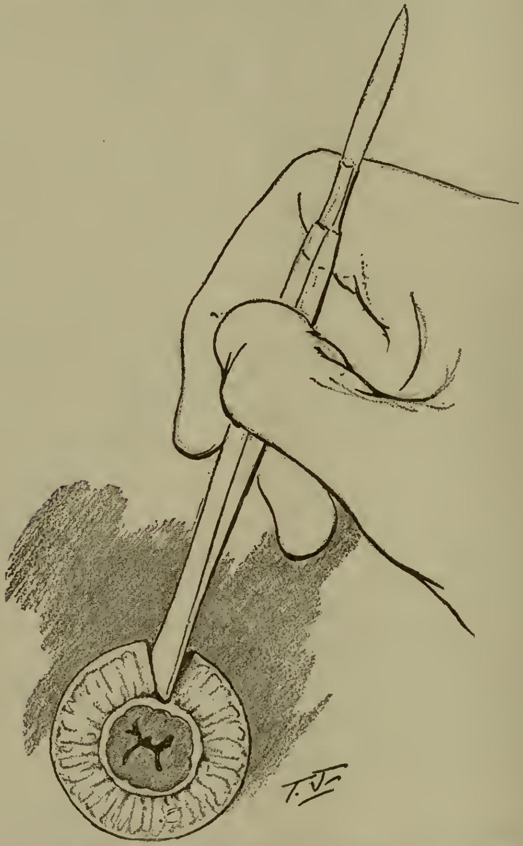

Fig. 36.—Cross-section through tumor at beginning of operation. Note infolding of mucosa and the narrow lumen of the pylorus. Dissection at this stage is done with blunt instruments.

operation in these 3 cases. She asked me on the second day after operation what had happened to the cases, because they were all vomiting, a condition which she had never met before. In 2 of the 3 cases we were able to save the patients only by very prompt blood transfusion and transfusion of glucose solution through the superior longitudinal sinus by the method of Helmholz. I think that this experience proves my argument.

In babies of three or four weeks of age the tumor is much smaller than in older patients. In these patients the Rammstedt operation produces almost complete relief. In the seven- to twelve-week-old patients the tumor is large, and the Rammstedt operation, in many instances, is not sufficient unless the mucosa is shelled out. We have noted in dissecting out the tumor in these 101 cases that the size of the tumor is in direct proportion to the age of the patient. In other words, we always find a small tumor or only a slight hypertrophy in the two- to four-week-old baby and always a large tumor in the seven- to twelve-week-old baby. There has been no exception to this rule, I believe, and it bears an important relationship to the etiology of this condition.

In 30 per cent. of these cases the tumor is more or less one-sided. Three-fourths of the hypertrophy is on the outer two-thirds of the pylorus, while the inner third is small and concave. In operating on these patients a single flap of tumor suffices.

In the postoperative care, hypodermoclysis has been resorted to only on one occasion outside of the cases which were operated on by the Rammstedt method. In this case we were unable to feel pulsation at the wrist either before or after operation. The child was not able to swallow and was fed by a catheter immediately after operation, 1 to 1½ ounces being given every three hours. In twelve hours we obtained the radial pulse, and the child went on to an uneventful recovery. One ounce of physiologic sodium chlorid solution is given by rectum every three hours. As soon as the child is awake it is fed alternately every two hours with mother's milk and water, 1 dram of each being given at a time. This is increased so that within twenty-four to thirty-six hours the child receives ½ ounce at each feeding and at the end of seventy-two hours the child is put to the mother's breast.

In only 6 cases out of the 101 have we seen any vomiting, and in these cases it was only a slight regurgitation. This, I believe, is due to the fact that the mucosa is completely shelled out and the tumor reduced, so that there is practically no resistance at the pyloric end. The vomiting which occurs following the Rammstedt operation, I am sure, is due to the fact that muscular contractions of the stomach have to enlarge the incomplete opening in the pylorus, which offers more or less resistance.

The second case which we shall now operate on is a patient twelve weeks old. If our theory is correct as to the progressive size of the tumor with advancing age, this one ought to be more than twice the size of the one found in the previous case.

I will now make the usual incision, and as I lift the tumor you see my estimate was correct. The tumor is more than twice the size of the one in the previous case. I will now complete the operation in the same manner as in the other case.

Note.—The 2 cases operated on in this clinic made uneventful recoveries, so we have a total of 103 operative cases with but 3 deaths.

CLINIC OF DR. CARL BECK

NORTH CHICAGO HOSPITAL

ECTROPION OF THE LOWER LID

Summary: Ectropion resulting from an acid burn; essentials of the operation for repair of the deformity.

THIS young man is recommended to us for correction of a deformity of his right lower lid (Fig. 37). It is the result of burns with acid during an explosion, causing scar formation and eversion of the lower lid. Several plastic operations upon the skin below the region of the scar produced by the burn have elevated, as the doctor writes, the lid as much as possible, but the deformity still exists. It is therefore necessary to do a plastic again. We see that the lid is drawn down because there is a portion of skin missing, and unless we are able to replace it from somewhere where the skin is in abundance and afterward will fit very well into the lower lid, we will have no result. The great difficulty of plastic operations of the lower lid consists in the fact that the piece of skin transplanted is usually too small, and later again drags the lid into the everted position. Particularly difficult is the operation if the individual is old and has a natural tendency for the lids to droop, or if the fat of the lower lid is missing and replaced by scar. Knowing these facts, we at first have to remove all the scar, every trace of it, then replace the lower lid defect by as much and more skin than the defect shows. We do that in the following manner:

First, as we said above, we excise all the scar, so that we have nothing but normal structures where the scar was before. That leaves quite a large defect, of an oval shape, somewhat irregular; then we measure out a flap on the side of the cheek which can be swung around about 45 degrees and insert it into the defect, where it is sutured in very accurately. The two lids are temporarily sutured together with a couple of stitches. In taking the flap we take along the subcutaneous fat and make our suture corresponding as much as possible to a natural line which every face shows and which is formed by a semicircle, with its convexity downward, from one corner of the eye to the other. It is that characteristic line which the draftsman outlines when he draws the eye.

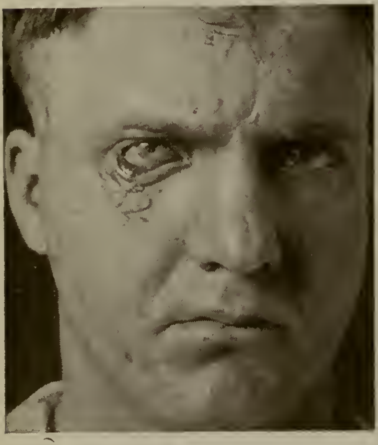

Fig. 37.—Before operation. Note eversion of right lower eyelid.

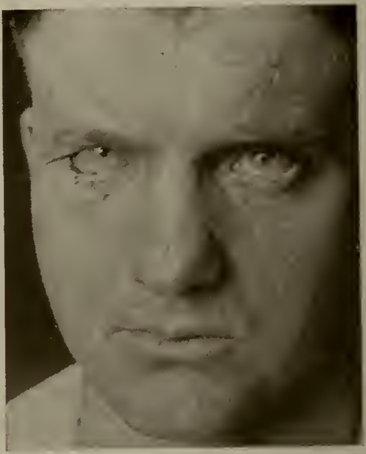

Fig. 38.—One week after operation. The scar tissue has been removed and the defect filled by a flap of skin and fat.

Postscript.—The stitches were removed in one week. The result was ideal (Fig. 38).

PLASTIC ON THE HEEL

Summary: Crushing injury of foot with denudation of the calcaneus; resultant disability from persistent ulcerating area exposing bone; repair by transplantation of skin-flap from thigh.

This young man twenty-six years old, a steel worker, sustained a crushing injury of his left foot, a fracture of his tibia and fibula, and comminuted fracture of his calcaneus, with destruction of a considerable area of the skin and underlying tissues around the heel. It took a long time for these injuries to heal. After several weeks in the hospital he was discharged with the condition we see on his foot at the present time. The fractures of the left tibia and fibula are healed and the function of the ankle-joint is very good. But the whole heel is covered with a glistening scar in the center of which we see granulations springing from the bone (Fig. 39). One can see that several attempts have been made at skin-grafting without success. It is well known that these wounds hardly ever heal spontaneously, and if they do, the scar is so thin and vulnerable that

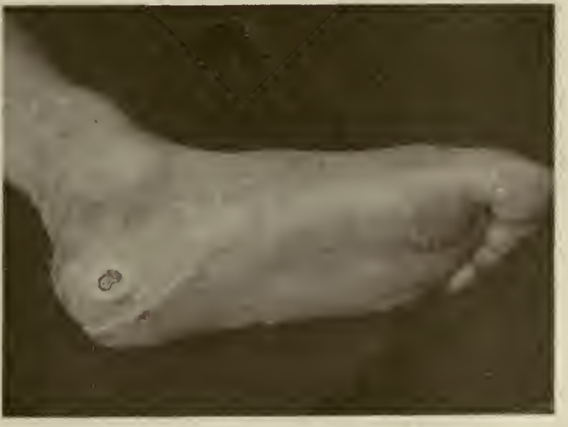

Fig. 39.—Before operation. Note granulating area through which bone is exposed.

healing is not permanent. That part of the foot needs a good solid pillow of skin and subcutaneous tissue over the bone, even thin skin will not do. The only way, therefore, to cure this man and restore the function of his foot is to perform a plastic operation, borrowing a flap from the other leg just above the knee-joint, which is the best area and contains enough tissue to form such a soft pillow. The operation is performed in the following manner: First, we have to remove all the scar tissue from the heel (Fig. 40), including the granulations from the bone, leaving behind a quite extensive denuded area over the heel and above the heel. It is necessary to have good skin, with subcutaneous tissue, all around the defect, so that we can unite good skin to good flap. Only in this manner can we obtain good primary union, which is essential for a good result.

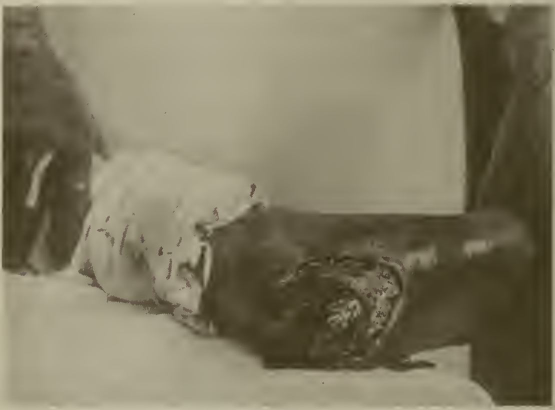

Fig. 40.—First step of operation. All scar tissue has been removed. The defect is now bordered by normal skin.

The next step is to form a pedicled flap, on the opposite leg, just above the knee-joint, more or less tongue shaped, with its pedicle on the proximal side. The foot is then placed in such a manner above the knee that the tongue-shaped flap can be inserted and very accurately adapted to the defect; it is sutured all around as far as possible, leaving unsutured only the base of the flap (Fig. 41).

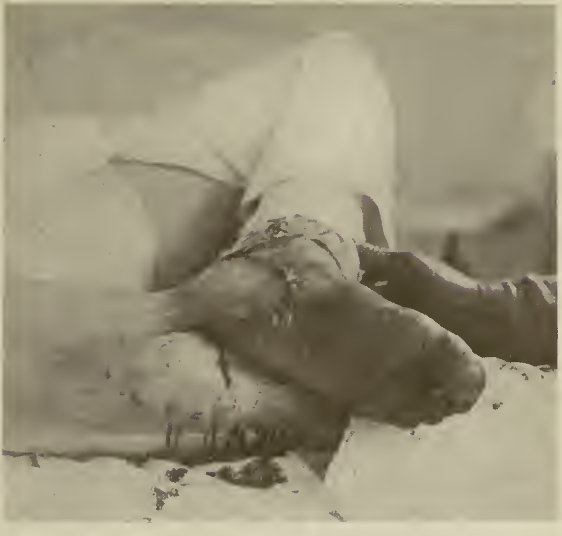

Fig. 41.—Flap raised from anterior surface of thigh and accurately sutured into the defect.

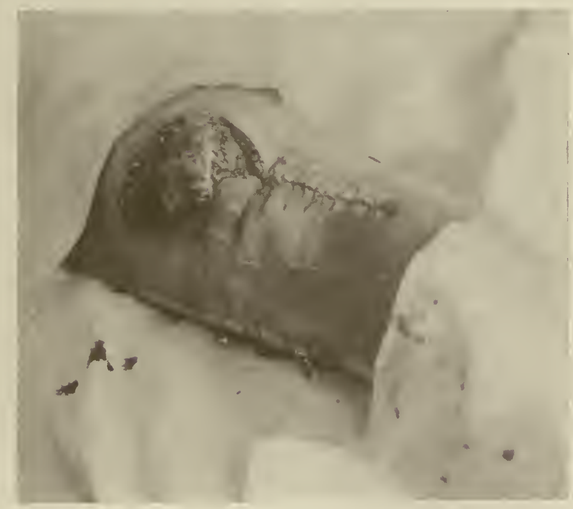

Fig. 42.—Previous to applying the flap to the defect in the heel the wound from which the flap has been raised is closed by suture.

An important matter is to suture the two borders of the skin, which have been formed by cutting out the flap, accurately be-

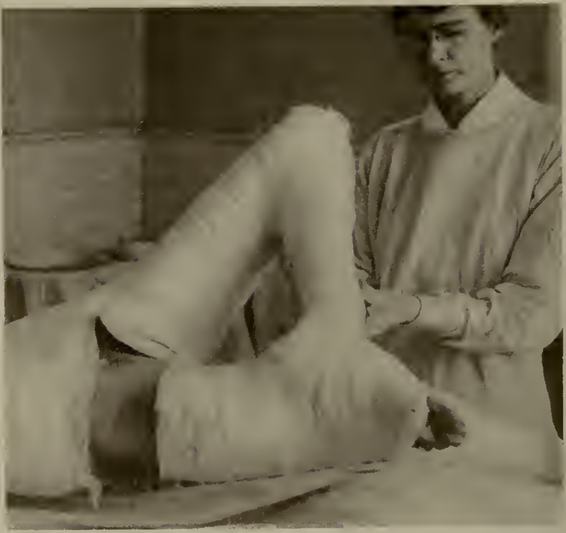

Fig. 43.—The position is maintained by means of a plaster cast extending above the hips.

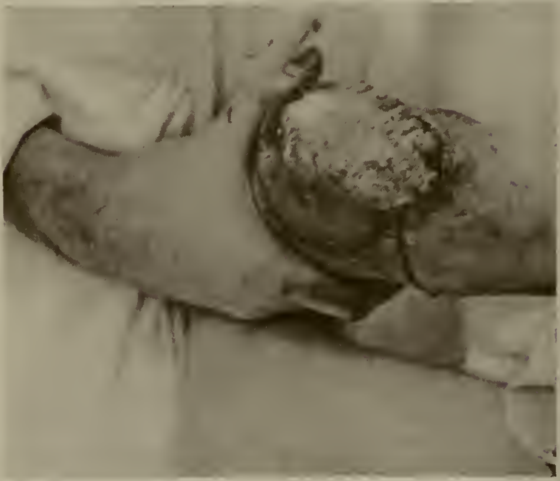

Fig. 44.—After ten days the cast is removed, the pedicle of the flap is cut and sutured in position.

fore the flap is inserted. This saves a secondary suture and makes a much cleaner job (Fig. 42). The wound is well protected with gauze and fastened with adhesive plaster directly, and then the two legs are put into a plaster cast which extends above the hip, preferably, inasmuch as absolute immobilization is very favorable for good primary union (Fig. 43).

The patients stand this position very well, and we leave them in the same position for about ten to twelve days, then we cut our flap at its pedicle and insert the fourth side of the flap into the remaining portion of the skin border, corresponding to the insertion of the Achilles tendon (Fig. 44) and close the remainder of the defect on the thigh by suture (Fig. 45).

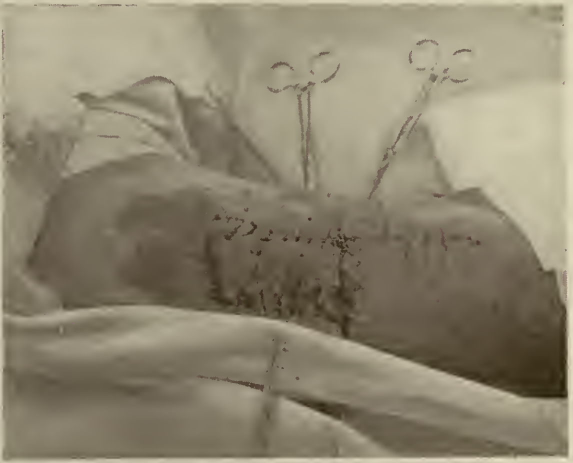

Fig. 45.—Remainder of the original bed of the flap closed by suture.

Primary union takes place in these cases invariably, and the result is absolute restoration of function of the foot.

UNUNITED FRACTURE OF TIBIA AND FIBULA: REPAIR BY OPEN OPERATION AND WIRING OF FRAGMENTS

This young man has been under our care for a long time. For about a year he was subjected to different operations on the nose and ears to restore shape and function. A series of plastic operations have been performed which have been very successful and have been described in this clinic (Surgical Clinics of Chicago, Vol. II, No. 6, p. 1217, Dec., 1918). In his jubilant mood he began to drive and ride horseback after he returned to his home in the South. Upon one of these occasions the horse ran away with him, threw him out of the buggy into an open field, and produced several fractures of his left limb—two simple fractures of the femur, one at the neck and one in the middle third, and a fracture of the tibia and fibula, compound and complicated with two large lacerated wounds, one in front and one on the inner side of the foot. For a short time it was thought that amputation was absolutely necessary, but owing to the very careful, diligent, and skilful attention of his physician, who takes great interest in the boy, a beautiful result of healing took place as far as the compound condition was concerned; unfortunately, however, and unavoidably, with bad position of the fragments. The femur is pretty well healed at the neck, with very little deformity; the shaft fracture healed with dislocation of the fragments and shortening of about 2½ inches. The boy is extremely worried about this, although the healing is not bad, the two fragments not much dislocated to the side, and the leg showing no diminution due to the fracture. The worst is the result functionally of the lowest fracture. It shows great deformity. The fractured ends are wide apart; the upper fragment of the tibia is adherent to a scar on the inner side of the foot, while the lower and pointed fragment of the tibia sticks out in front and is healed over by a thin, painful scar. The foot is useless (Fig. 46). Whenever the patient desires to move his foot he has to hold it with his hands and it can be moved around like a flail to all sides. This deformity causes also a shortening of the limb of about 2 inches. Altogether there is between 4 and 5 inches shortening of the whole leg.

Considering this very bad state of affairs, which is clearly borne out by *x*-ray pictures (Fig. 47), we see that restoration by surgical means is absolutely indicated. Great difficulty is expected in the attempt to obtain apposition of the fragments even in a straight line. We have no hope of lengthening the leg by our surgical operation. With this prospect in view, we decide to operate only on the lower fracture.

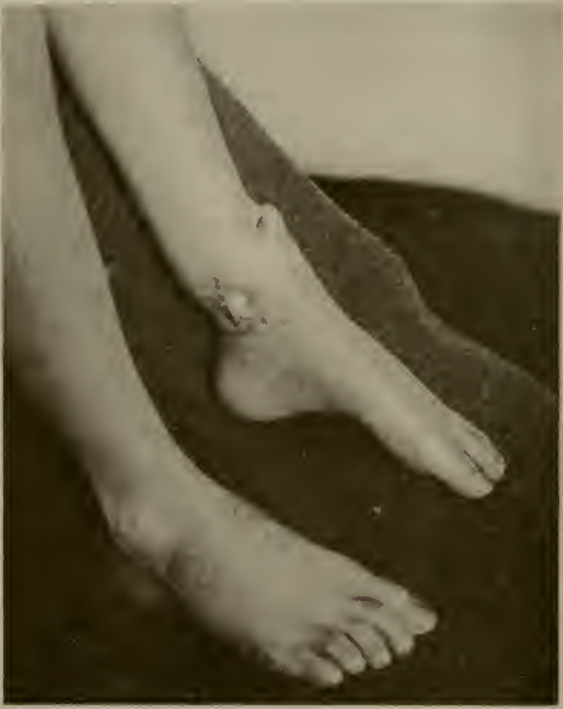

Fig. 46.—Before operation. Note great deformity at site of fracture.

The operation consists of several steps: first we incise the limb over the scar at the lower portion of the tibia and free the pointed lower fragment of the tibia. This allows us to examine into the possibility of bringing the spirally broken ends of the tibia together or closely in apposition, and we find that such is impossible; the upper fragment of the tibia is so far pushed down toward the foot and to the side that the extrication of this fragment from scar tissue alone becomes very difficult, and we will have to be satisfied if, after remodeling the ends, we can bring them to apposition, not end to end, but side to side. The peroneal muscles and tendons are lying between the fragments and a mass of cicatrical tissue besides. After a good deal of manipulation and dissection we finally are able to displace the peroneal muscles and tendons. We remove sufficient bone from both fragments to adapt them side to side, and after coaptation of the two freshened surfaces we restore the tibia to its shape,

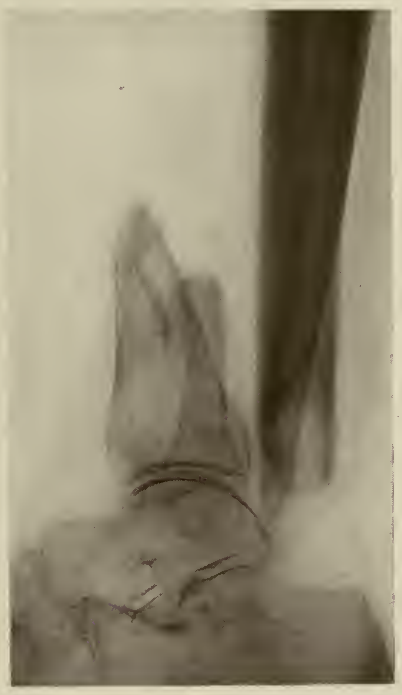

Fig. 47.—Roentgenogram showing position of fragments before operation.

although shortened, and keep it in position by a couple of wire sutures.

Postscript.—Two weeks later we performed a similar operation on the fibula. The reason we did not do these two operations at the same time was that we were afraid that by making too many cuts into the tissues at the level of the lesion we might interfere with the blood-supply and endanger the life of the extremity (Fig. 48). Since this operation the tibia and fibula have become firmly united and the limb useful again. The boy insists upon correction of the deformity of his femur, and we shall describe this procedure in the next number of the Surgical Clinics.

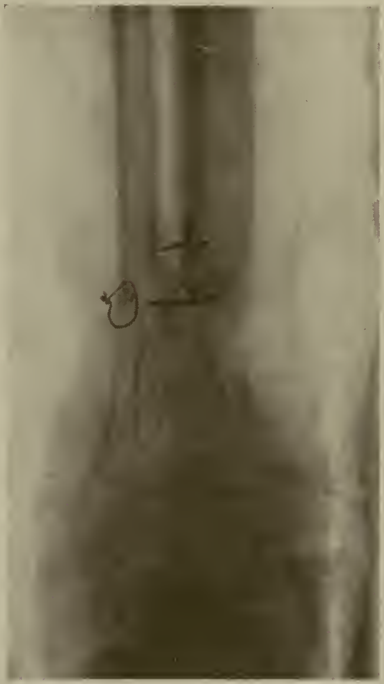

Fig. 48.—After operation; the fragments held in position by loops of silver wire.

CLINIC OF DR. CARL B. DAVIS

Presbyterian Hospital

LYMPHOSARCOMA OF THE SPINE

Summary: Paraplegia of two years' standing, with loss of all sensation below the level of the fifth thoracic segment; visible and palpable subcutaneous tumor at corresponding level of back. Operation—removal of hour-glass-shaped lymphosarcoma, partly intraspinal, connected with external tumor through two intervertebral foramina. Sudden postoperative development of decubitus.

A WOMAN aged forty-nine was seen by Dr. Bassoe on January 24, 1919. In January, 1916 she began to complain of pain in the scapular region, radiating around the chest. The pain gradually grew worse. Unsteadiness of gait was noticed in June, 1916. Later the legs grew weak, and after February, 1917 she could walk only with crutches, and early in 1918 became bedridden. Numbness in the toes began in January, 1918, and ascended. Control of the sphincters was lost at the time she became bedridden. A soft tumor of the back was accidentally discovered in June, 1918, located between the scapulæ at the point where the pain was first noticed.

Examination (January 24, 1919) revealed total paralysis of the lower extremities and of the abdominal and lower thoracic muscles. There were marked knee- and ankle-clonus and a positive Babinski sign. The legs were extremely rigid and involuntary movements were caused by the lightest touch. The upper extremities and cranial nerves were normal. Loss of all sensation below the level of the fifth rib was noted. A palpable tumor in the back muscles, 1 cm. to the left of the fourth and fifth thoracic spines, was easily demonstrable. The spinal fluid was under low pressure, clear; cell count 10; Nonne-Apelt globulin test weakly positive; Lange test weakly positive (0,112,211,-000). Examination of the viscera was negative. No glands were palpable. Rectal and vaginal examinations were negative except for a slight rectocele. The appearance of the patient was suggestive of anemia, but blood examination showed hemoglobin 81 per cent.; red blood-cells 4,540,000; white blood-cells 9100; blood-pressure, systolic 120, diastolic 80. Roentgen ray examination of the spine was negative.

The patient was referred to our service for operation. The usual paraspinal incision was made and a flap turned over, exposing the third, fourth, fifth, sixth, and seventh spinous processes. The erector spinæ muscles, after blunt dissection, were pulled laterally and all bleeding checked by ligatures and compression with hot packs. The tumor mass mentioned above was seen to extend from beneath the fascia through the muscle and between the fifth and sixth laminæ into the spinal canal. The fourth, fifth, and sixth sets of laminæ were resected and the cord exposed. The new growth extending along the dura mater did not infiltrate, but readily pulled away as a tumor mass 4.5 cm. long, 1.7 cm. wide, and 1 cm. thick. The cord was compressed into a narrow, ribbon-like form. Proximal to the tumor the dura ballooned out. On removing the tumor the distention disappeared, suggesting somewhat the dissipation of spinal fluid. The mass did not seem to infiltrate the bony wall and showed no evidence of entering the canal from in front. The dura was not opened. The muscles were replaced and the wound closed.

Five weeks after operation the patient could recognize pain from prolonged pressure on either leg. Sensation was delayed several seconds. A decubitus developed over the sacral region, and although she was on a water-bed and was kept in an upright position a portion of the time extensive bed-sores developed and the patient died of bronchopneumonia in March, about six weeks after operation.

The tissue was diagnosed by Dr. LeCount as a lymphosarcoma of the same histologic character as that described by Kundrath, and later by MacCallum.

A striking feature of this case is that for one year the patient, a very large woman, was soiled by involuntary escape of urine and feces and could only turn over in bed when rolled by an attendant, yet the patient failed to develop any break in the skin. About four weeks after operation there was a sudden breaking down of the skin, and in spite of all efforts and precautions a decubitus extended across the back and thighs as far forward as the anterosuperior spines. It was suggested that this rapid destruction of tissue might in some way be due to trophic disturbances in the cord following edema, secondary to the release of pressure on removal of the tumor mass.

It seems that this might be avoided in a subsequent case by suspending the patient in a support similar to the Rauchfus sling, or at an earlier stage have her assume an upright position in a chair.

EXTRADURAL FIBROMA OF THE SPINE

Summary: Paraplegia of one year's standing with prolonged remission; removal of extradural fibroma, followed by slow, steady return of motion and rapid return of sensation.

This boy, aged fifteen, upon admission to the hospital in November, 1918, gave a history of having developed an almost complete paralysis of both legs during the summer of 1917. At that time there was some pain in the lower chest on both sides, but no sphincter disturbance. The paralysis lasted only a month. In the spring of 1918 the symptoms gradually returned, and by the beginning of October both legs became paralyzed and spastic. Only slight pain was complained of.

The results of the examination made on admittance are recorded as follows: "Spastic paralysis of both legs with great rigidity whenever limbs are handled. The upper thoracic muscles contract. Beevor sign present. Bilateral Babinski sign, knee- and ankle-clonus present. Abdominal and cremasteric reflexes absent. Loss of touch and pain sense total below costal margin and relative below level of sixth rib. Roentgen ray examination of the spine negative. The spinal fluid gave a negative Wassermann test, cell count 7, weakly positive Nonne-Apelt and Lange test (0,112,110,000)."

A brief course of antisyphilitic treatment was given without any benefit, whereupon a tentative diagnosis of spinal cord tumor was made by Dr. Bassoe and the patient was referred to us for exploration.

The usual technic for laminectomy was employed and the cord was exposed beneath the seventh, eighth, and ninth sets of laminæ (Fig. 49, 1). An extradural tumor, lenticular in shape, 3 cm. long, 1 cm. wide and thick, was found. The tumor arose from the posterior lateral wall of the bony canal and compressed the dura and cord into a ribbon-like structure (Fig. 49, 2). The tumor did not invade the dura and was readily enucleated.

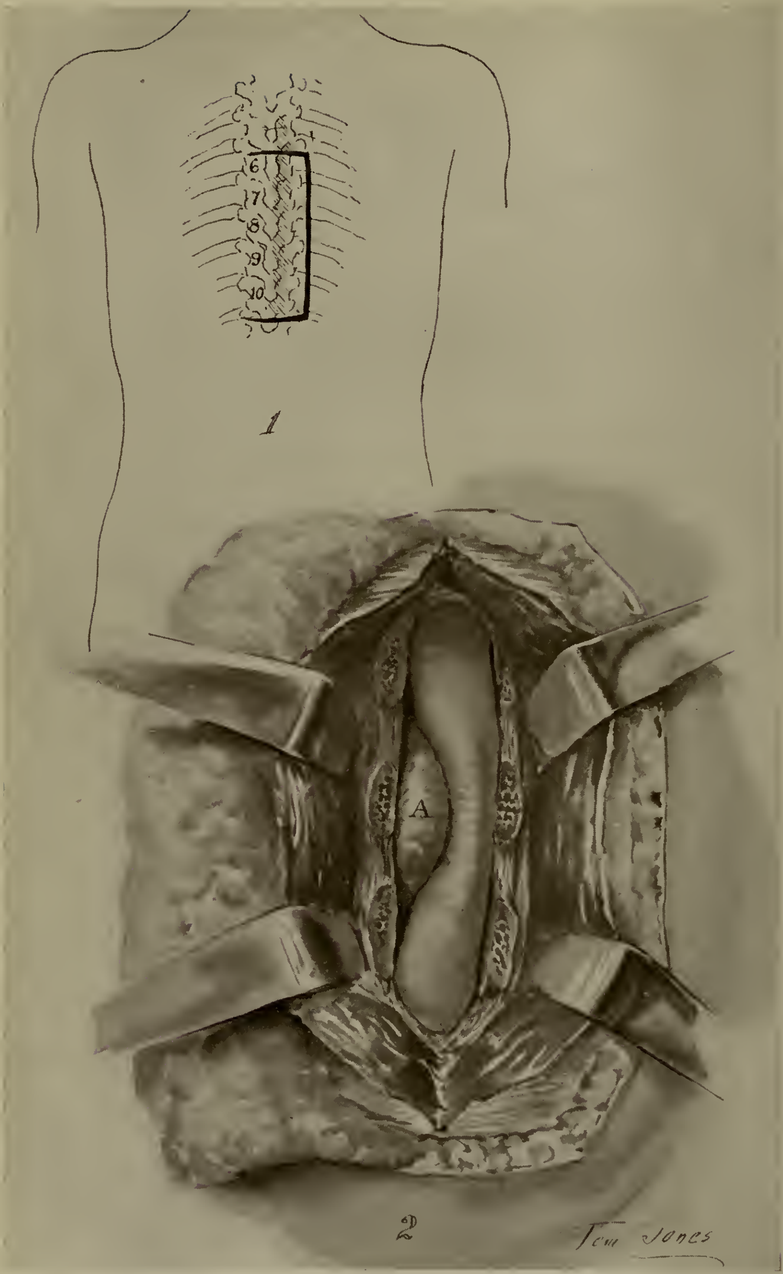

Fig. 49.

A moderate hemorrhage from its bony origin occurred after removal. The tumor was a fibroma, in the center of which was a semi-organized blood-clot. The presence of the central blood-clot would account for the sudden paralysis and subsequent rapid recovery in 1917.

The patient soon regained sensation, and after three weeks a slight return of voluntary motion in the toes of the left foot was noted. From that time return of power has been fairly rapid. The boy walked without crutches late in the summer, and is now attending school. There is still slight spasticity in the legs.

Fig. 49.—1, Skin incision for exposure of vertebral spine and laminæ; 2, spinal canal opened. A tumor (*A*) is seen rising from the posterior lateral wall and compressing the cord.

ULNAR PARALYSIS

Summary: Loss of function, motor and sensory, in the ulnar distribution thirty-eight years after fracture of the lower end of the humerus. Diagnosis: Interpretation of supplementary muscle action. The prehension sign of Froment.

Four years previous to entering the hospital the patient first noticed tingling and hyperesthesia in the fourth and fifth fingers of the left hand; one and a half years later it was noticed that the grip in the hand was lessening. About this time he first noticed atrophy in the back of the hand, most marked between the thumb and index-finger. Thirty-eight years ago the humerus was fractured above the elbow and the bone healed with exaggeration of the carrying angle.

Physical examination shows a deformed left elbow, atrophy of the back of the hand, and of the hypothenar eminence. Adduction and abduction of the fingers are absent except for the slight action of the supplementary muscles, as described by several French writers, and more recently by Pollock. The patient is unable to grasp a golf club with the left thumb in the usual manner, due to paralysis of the adductor pollicis, but he overcomes this deficiency through median innervation by pressing the tip of the thumb against the shaft by action of the flexor longus pollicis. Doubtless the grip is also aided by the opponens pollicis. Sensory function is absent in the fourth and fifth fingers.

Operation.—An incision was made over the course of the ulnar nerve. A slight bulbous enlargement was found at the point where the nerve passed back of the bony prominence. The sheath of the nerve over the tumefaction was incised longitudinally and the nerve transplanted in front of the condyle (Fig. 50, 1). A generous layer of subcutaneous fat was turned

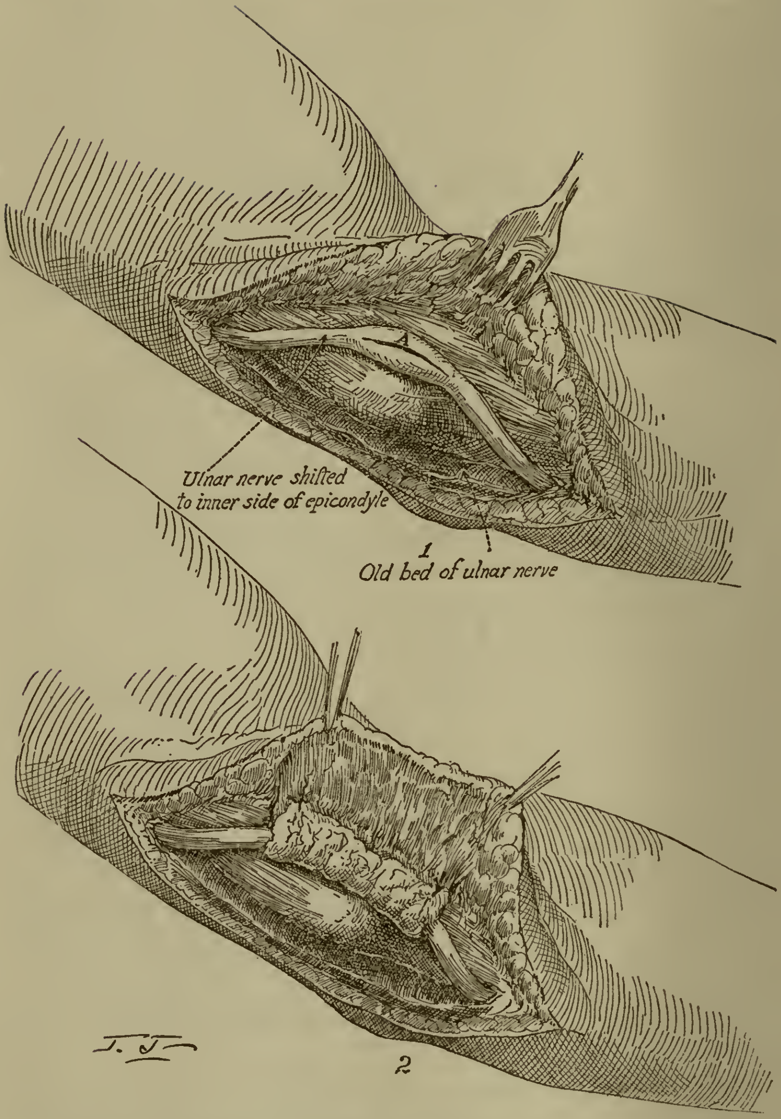

Fig. 50—1, Ulnar nerve exposed and transplanted anteriorly to epicondyle. A longitudinal incision (*A*) was made through the sheath of the nerve over a bulbous enlargement; 2, nerve protected in its new position by a generous flap of fat and fascia.

down and about the nerve and the skin closed (Fig. 50, 2). The wound healed without incident.

Six months after operation the patient reports a return of tingling and hyperesthesia in the fourth and fifth fingers. There is no motor return as yet. Motor function at times, of course, is months later than the return of sensation.

This case is an excellent example of supplementary muscle action. Primarily adduction and abduction of the fingers are performed by the palmar and dorsal interossei, innervated by the ulnar nerve. Interpretation of these actions admits of a number of limitations, for an ulnar action is readily masked by substituted movements. With forcible extension of the fingers by the extensor communis digitorum, innervated by the musculospiral, there is a degree of abduction of the fingers, but not the same wide abduction produced by ulnar innervation of the dorsal interossei. Flexors of the fingers, with median innervation, also act as adductors, but only while flexing the fingers in the act of adduction. The interossei adduct and abduct the fingers without flexion or extension. A convenient method of checking these accessory actions is to place the hand on a table and work the fingers in a purely horizontal plane.

The action of the thumb is interesting. The ulnar nerve supplies all the muscles of the thenar eminence except the abductor pollicis, the opponens pollicis, and the outer head of the flexor brevis pollicis, which are supplied by the median. Thus the ulnar supplies entirely the adductors of the thumb and partially the flexor brevis pollicis. To grasp a book between the thumb and index-finger two movements are possible. Either the book is firmly grasped between the body of the thumb and the half-flexed index-finger, or it is taken between the extremity of the thumb and that of the index-finger set against one another. This latter motion only is retained in ulnar paralysis and is due to the actions of the opponens pollicis and the flexor longus pollicis innervated by the median. This type of prehension in ulnar paralysis is known as the thumb sign or prehension sign of Froment. A convenient dictum learned in student days is helpful in recalling the nerve and muscle groupings of the hand—all the intrinsic muscles of the hand are supplied by the ulnar nerve except two and a half muscles in the thenar eminence and the two outer lumbricales, supplied by the median nerve. The two and a half muscles are the abductor pollicis, the opponens pollicis, and the outer head of the flexor brevis pollicis.

CLINIC OF DR. LEWIS L. McARTHUR

St. Luke's Hospital

SARCOMA OF THE POSTERIOR TIBIAL NERVE: EXCISION; REMOVAL OF METASTATIC FOCI IN RETROPERITONEAL LYMPH-GLANDS THREE MONTHS LATER

Gentlemen: Let me invite your attention to the interesting condition obtaining in the patient about to be operated on, a synopsis of whose history will be read by my house surgeon.

History.—This patient is forty-three years of age, is married, and has one child. He has had general good health with the exception of acute inflammatory rheumatism in the hands and feet ten years ago and a neisserian infection in youth, without complications.

In February, 1919, he began to have pain in the right foot *with numbness* of the sole of the foot, and a tendency to exaggerated "hammer-toes." This discomfort was worse at night. During the past five months he has been through all the antirheumatic treatments, including a trip to Mt. Clemens and its salt baths. An orthopedist prescribed for weakened arch, without avail. The patient could be about with the aid of a cane or crutch.

July 14, 1919: On examination at the office there was discovered a tumefaction of the inner aspect of the lower half of the right leg, not easily outlined; the sole of the foot was insensitive to touch, to needle prick, or to heat and cold; the plantar flexors were paralytic.

x-Ray pictures, here submitted for your examination, failed to show the slightest involvement of either bones or periosteum.

The Wassermann test was then made and found negative. None of the stigmata of syphilis were present. On this basis, operation was advised, with a tentative diagnosis of neurofibroma of the posterior tibial nerve.

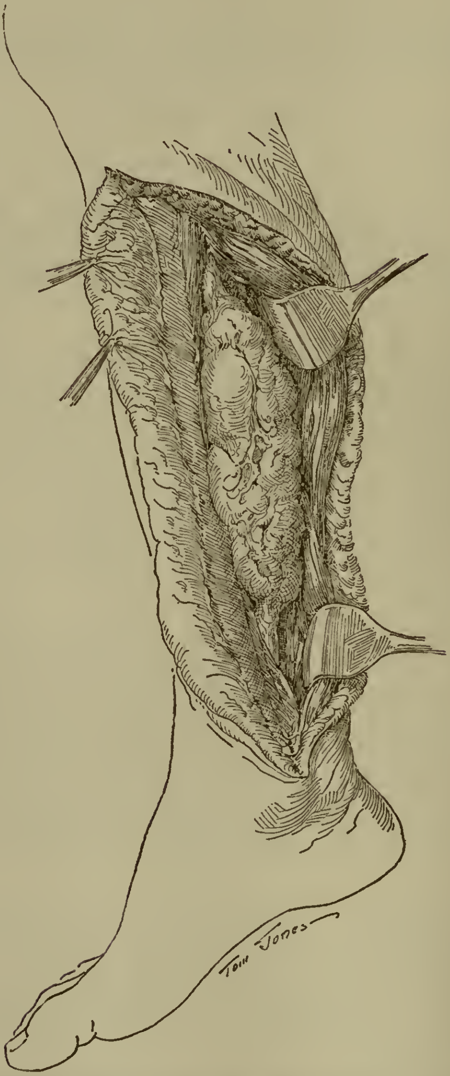

Fig. 51.—Tumor thoroughly exposed preparatory to removal.

Operation.—The incision is made over the inner aspect of the right leg down to the mass, which is found to lie beneath the bellies of the gastrocnemius and soleus muscles, which are greatly thinned out over it. These muscles are retracted inward and backward, and the growth found to be a capsulated one, easily enucleated by the finger, but far more extensive than objective examination revealed (Fig. 51). It is being shelled out of the interval between the tibia and fibula, posteriorly; it terminates above and below in a polar elongation, which proves to be the posterior tibial nerve.

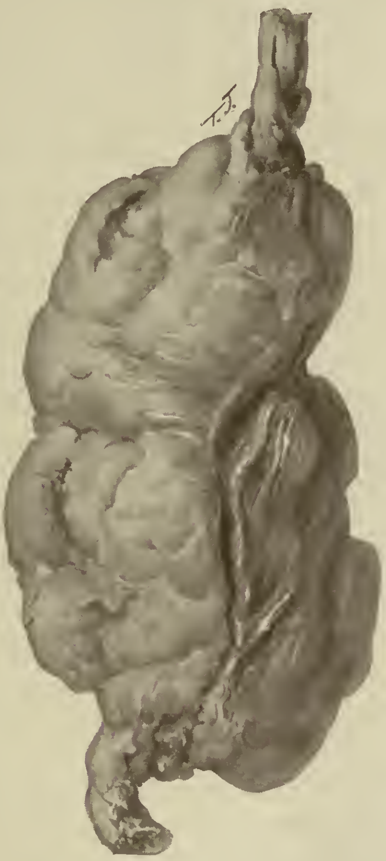

Fig. 52.—Specimen after removal. Note the incorporation of the nerve trunk in the tumor mass.

Painstaking efforts to trace the nerve trunk reveal its obliteration in the tumor substance both above and below, so extirpation of the tumor with resection of the nerve trunk becomes imperative. Possibly at some later date we may be able to insert a nerve graft (Fig. 52).

The 9-inch wound is closed without drainage. We venture a clinical diagnosis of giant neurofibroma.

Postscript.—The wound healed by primary intention. Two weeks later, after careful study, Drs. LeCount and Hirsch reported the tumor to be a primary sarcoma of the nerve, originating probably in the nerve-sheath (Fig. 53). The extreme rarity of this finding justifies this report.

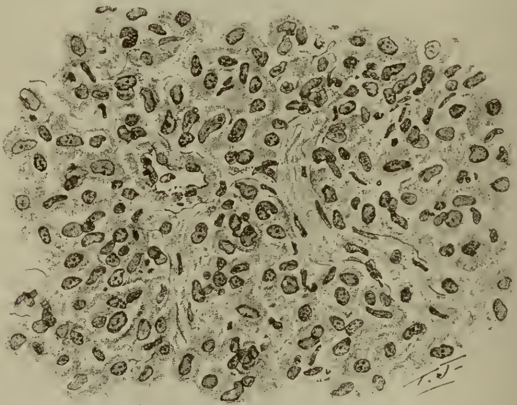

Fig. 53.—Appearance of tumor in section under microscope (high power). The metastases in the retroperitoneal lymph-glands present an essentially similar picture.

Three Months Later.—Locally, wound healed and without recurrence. The patient has been treated energetically with *x*-ray for prophylaxis. Within the abdominal walls, at the level of the right internal inguinal ring, a large mass was to be felt the size of a hen's egg, which was regarded as a metastasis, and operation advised.

Operative Findings.—After removal of abdominal tumor a mass of soft, pultaceous, enormously enlarged lymph-glands were removed from contact with the external and internal iliac arteries. The pathologist reported sarcoma of lymph-glands.

CLINIC OF DR. GEORGE D. J. GRIFFIN

Mercy Hospital

EMPYEMA: A BRIEF RÉSUMÉ OF TREATMENT

Summary: Common factors in the etiology of empyema of the chest. Methods of treatment—radical and conservative. Pronounced superiority of the Thiersch closed method in the treatment of acute empyema with associated acute pulmonary disease.

Every medical man who saw service in the army, whether on the medical or on the surgical service, came in contact to some extent with empyema; and coming in contact with it was amazed by both its frequency and its ravages. It seemed to follow almost any chest condition and to be always of a fulminating and virulent nature.

It was not uncommon for a chest to fill in twenty-four hours. Many cases presented themselves that previously had no symptoms of respiratory distress, and yet upon examination were found to be fully developed cases of empyema.

Many questions were raised by its occurrence and prevalence, and many of them are yet unsatisfactorily answered.

In a given number of cases of influenza, pneumonia, or measles in civilian practice, as compared with the same number of cases in the army in camp in America, the records will show a far greater proportion of empyemic complications among the soldiers. I specify intentionally "in America," because I had no experience with and am unfamiliar with empyema in the army in France. My activities in France did not bring me in contact with it. This unusual prevalence in military life causes one to wonder. The life led in the army is theoretically correct. It is an outdoor life of regular habits and regular exercise. The argument that the individuals leading it were under, to them, abnormal conditions does not serve; the answer that temporarily their resistance was lowered because of the vigorous and intensive training will not explain. It might serve as an explanation for the number of fatalities from the various conditions. The community life led by them, of course, will explain the great number of infectious and contagious conditions, and it was only through the unheralded work of the medical officers, who so vigorously and determinedly handled the various situations, that an even greater number did not occur. That is historic, however, and does not really come within the province of this discussion.

I am not a bacteriologist, but it has occurred to me as an explanation that the exciting microbic cause of empyema took on special characteristics. In view of Rosenow's experiments of several years back, in which he showed that a changing series of characteristics can be evolved in and by a definite micro-organism to excite in the human body a pathologic process entirely foreign to its original nature, it seems plausible to me that by transmission through a series of individuals with empyema, a streptococcus, a pneumococcus, or a staphylococcus could undergo morphologic changes, become selective in its type, and be almost a specific empyemic invading micro-organism.

Cocci seem to have been the most frequent, if not the exclusive, bacteria in empyema. In a series of 45 cases at the Base Hospital, Camp Gordon, Georgia, the streptococcus was found alone in 34, and combined with other micro-organisms in 2. Therefore the streptococcus was found in 36 cases, or 80 per cent. The pneumococcus was found in 2 cases, 1 of Type two and 1 of Type four. In the remainder of the series, 7, no cultural report was attached to the history.

In so far as the clinical diagnosis was concerned, 19 cases, or 42.18 per cent., complicated a bronchopneumonia secondary to measles; 15 cases, or 33⅓ per cent., complicated a primary lobar pneumonia; 8, or 17.76 per cent., complicated a lobar pneumonia secondary to measles; 2, or 4.44 per cent., complicated a bronchopneumonia following influenza, and the 1 remaining case followed an apparently primary bronchopneumonia. It will thus be seen that over 50 per cent. of this series of cases of empyema resulted indirectly from measles.

Unfortunately, the case records made no mention of the type of streptococcus, but a second series of 30 cases, at the same place, showed about 75 per cent. of the streptococcic cases to be of the hemolytic variety. I regret greatly that it is impossible for me to present a résumé of the second series of cases, but my personal notes on them were lost in my moving about in France. It is possible, however, for me to give from memory a fairly accurate description of the series, because I, personally, with the assistance of Dr. Robert E. Hearn, of Paducah, Ky., who was at that time also on the surgical service at Camp Gordon, and who collaborated with me in the analysis of the cases, made an abstract of each case. They are, therefore, imprinted indelibly on my memory. This second series of cases followed very closely the lines of the first series.

I am more interested in this discussion in devoting time to treatment rather than to any other of the many phases of empyema. Prewar methods of treatment have apparently undergone radical changes. These changes, however, are only on the surface, as a careful scrutiny and a little thought will show. Formerly the great majority of our empyemas were secondary to tuberculosis and pneumonia. They were also the despair of the surgeon. Everybody remembers the constantly draining, ever-present sinus and the perpetually refilling cavity that persisted not over a period of months, but over a period of years. This particular class of cases was usually tubercular, and like a sinus in any other part of the body that was tubercular or that had tuberculosis behind it, absolutely refused to close no matter what method of treatment was devised. It was particularly for this class of cases that the various radical and mutilating operations were perfected and resorted to. The methods of prewar treatment could be most simply divided into radical and conservative. Radical treatment was resorted to for the chronic cases of empyema and comprised the following methods:

1. Operation of Estlander.
2. Operation of Schede.

3. Operation of Fowler.
4. Operation of Ransohoff.
5. Injection of Beck's paste, formalin in glycerin, etc.

The first two operations automatically group themselves, as do the third and fourth, and the two operations of each group are merely modifications of the other. Estlander's operation provides for the removal of portions of the second to the seventh ribs with the periosteum. Schede removes the entire rib, from the costal cartilage in front to the tubercle behind, and from the second to the seventh ribs inclusive. Both operations have for their basic argument the collapse of the chest wall, removal of the rigid portion, and curetage of the visceral pleura so that union may take place between the latter and the soft tissues of the chest. Fowler's operation provides for a further step. The entire ribs are not removed, merely 1½ or 2 inches of each. The pleura, parietal and visceral, is stripped from its seat and removed. The lung is expected to expand and fill the cavity. Ransohoff provides for a series of incisions in the pleura about ¼ or ½ inch apart in those cases in which pleural decortication is impossible. The injection of various compounds, Beck's paste, formalin in glycerin, iodoform in glycerin, etc., has also been used with varying success. I have only touched the surface in the radical treatment, but feel that it was necessary to include a few remarks on it for the purpose of making my point clear.

We come next to the conservative treatment, and return to the series of military cases. All the cases came to the surgical service from the medical service. This is a point of especial significance. It means that the medical service failed to cure or benefit empyema. In the early army experience many cases of empyema on the surgical service died following operation, so many, in fact, that the medical men became reluctant to transfer their cases. They started aspirating all the empyemata that developed. This was heralded as a new method of treatment of that condition. It, however, was a revival of a very old method that had fallen into disuse from its failure to cure. The old surgical axiom that pus anywhere in the body should be evacuated still holds firm. So after aspiration had been instituted it was found that few cures were accomplished and that as many patients died. The result was that once more empyema became a surgical condition to be treated by surgical methods. All these cases of empyema in the army were acute empyema, as differentiated from the chronic variety, the operations for which I have already mentioned. The conservative methods of treatment have always been applied to acute empyema and are as follows:

1. Aspiration.
2. Incision and drainage.
3. Rib resection and drainage.

The medical men adopted the first method, and it failed and failed signally. It was, nevertheless, continued as a method of treatment, and it was only after failure of cure and lack of improvement had been demonstrated or alarming symptoms had developed in a given case that that case was transferred to the surgical service for more radical treatment.

With aspiration ruled out, two methods of conservative treatment were left, the rib resection and drainage and incision and drainage.

1. **Rib Resection and Drainage.**—This has been a method of choice for a long time for many reasons, primarily because drainage was facilitated by the removal of a portion of a rib. A larger tube could be inserted with less possibility of blocking of that tube. In the 45 cases shown here, this method was used in 38. In those 38 cases, 20, or 52.6 per cent., promptly died, and 18, or 47.4 per cent. lived. Not a very glowing result.

2. **Incision and Drainage.**—This was the second method of conservatively treating the condition. Its objection has been that the tube was sometimes compressed between the ribs and obstructed or blocked by a thick secretion, a small tube being used of necessity. Only 4 of the 45 cases were treated by thoracotomy, 3 of which, 75 per cent., died. Of the remaining 3 cases of the series in which the technic was omitted, 2, or 66⅔ per cent., died.

These results are appalling, from 52.6 to 75 per cent. of cases dying under recognized and apparently proved technic. Such results in the civil treatment of empyema were unheard of, and if they had been, the technic would certainly have fallen into innocuous desuetude. Again, the contrast between civil results and military results causes one to pause and ponder.

There were, however, two points, two important factors in military empyema that apparently escaped the notice of the surgical forces: First, that empyema was not a condition in itself. Encountered in the army, it was a coincident complication of some type of pneumonia. By the term "coincident complication" I mean that its onset was during the height of the pneumonia process and was an added burden for an already overtaxed resistance. Second, and of equal importance, surgical shock was a force of magnitude. In an ordinary empyema following pneumonia after the pneumonic process has undergone resolution the ordinary conservative surgical methods offer little real shock to the patient. During an active pneumonia, with all the vital force of the patient mustered in resistance, even a minor operation may be followed by true surgical shock. The removal of a portion of a rib may send battering impulses along the nerve routes that serve to break down the resistance of a system that is already swaying in the balance.

This seemed supported in the second series of 31 cases, in which only 3 cases, or less than 10 per cent., died. These cases were drained, but in a somewhat different manner, to minimize shock, trauma, and prolongation of the operation. These results were not effected by any new method of treatment, but rather by one of the oldest methods. One rarely hears now of the Thiersch method, and in uncomplicated cases it is not a method of choice. It does, however, minimize trauma and shock and is a very quiet and simple procedure.

Under local anesthesia a small incision is made in the skin, and then a large size trocar is inserted and carried through into the pleural space. A catheter is pushed through the trocar and clamped. The cavity should not be immediately and totally emptied. Some hours after the operation, if operation it can be called, the clamp may be removed and from 200 to 300 c.c. of pus permitted to run out. This may be repeated every day or even twice a day thereafter. After the pneumonia has subsided and after the chest is partially emptied, then, if it is desirable, the tube may be connected with a bottle and constant drainage instituted until a cure has been effected.

The original procedure, if proper anesthetization is obtained, and it can and should be obtained, is painless. The patient need not be disturbed. It can be done in the ward or room in which the patient is confined. No mussy, saturated dressings are bound around the patient and he is quite comfortable. Examination is not interfered with. At first sight it would seem to be a replica of the repeated aspiration. On analysis, however, it is different. Repeated aspiration is a tax on the patient. Each aspiration is additional trauma, with or without pain, and the patient anticipates each one with apprehension and increased nerve tension. The reduction of a total mortality in the same condition, from 55.56 per cent. in one series to less than 10 per cent. in another series, justifies the use and revival of the method in those cases of empyema at least that occur simultaneously with active pneumonia.

CLINIC OF DR. BENJAMIN F. DAVIS

PRESBYTERIAN HOSPITAL

TRAUMATIC SEPARATION OF THE UPPER FEMORAL EPIPHYSIS

Summary: Characteristic physical and *x*-ray findings in a neglected case; etiology; treatment—the abduction method; results.

The particular pathologic conditions illustrated by the case here presented is relatively rare, but it belongs among a group of lesions, as a whole considerably less rare, and of considerable clinical importance because of the frequent failure of medical attendants to make a diagnosis until much valuable time has been lost. I refer to the condition known as "slipping of the femoral epiphysis," occurring in adolescents, and to fractures of the neck of the femur in children. Cases are seen not infrequently in which the obvious diagnosis has not been made and which have been treated as cases of arthritis, tuberculous or streptococcic, sprain of the hip, or for some lesion of the knee because of pain referred to that locality; all this in spite of the ease with which the proper diagnosis may, as a rule, be made by physical examination, especially if checked by the roentgenologist. Occasinally one may be confronted with an early case of slipping of the epiphysis, in which only a competent orthopedic surgeon in association with a good *x*-ray man may venture a positive diagnosis; such cases, however, present a train of symptoms which should at least arouse a suspicion of the true nature of the condition even before the specialist is consulted.

This patient is fifteen years of age. In October, 1918, he fell off a horse, striking on the left hip and buttock. He was assisted to his home, being able to bear some weight on the left leg, and was confined to bed for about ten days because of pain and soreness in the left hip. When allowed out of bed he quickly resumed his ordinary routine of school and play with practically no discomfort until April, 1919. About this time the hip became painful on weight bearing; this condition gradually became worse until in May, about four weeks after the onset of this trouble, the patient lost all use of the leg. At this time he was supposed to be a victim of mono-articular arthritis secondary to a focal infection, and, as he had considerable pyorrhea and a number of dental cavities, he was given an ether anesthetic and fully half of his teeth were extracted. His hip got no better after this procedure, however, and he was brought to my service at the Presbyterian Hospital about a week later.

Examination disclosed as the only abnormalities numerous healing wounds of the gums at the sites of the teeth which had been extracted, and the diseased left leg which had caused his disability. The leg lay extended, somewhat adducted, and in complete external rotation so that the lateral border of the foot lay on the bed. Measuring from the anterior superior spine to the internal malleolus the left leg was 1½ inches shorter than the right; the great trochanter was elevated 1 inch above Nelaton's line, and seemed to have rotated with the foot so that it lay in a plane somewhat posterior and at an angle to the normal. As motion in any direction was painful, further examination was dispensed with and the patient sent to the *x*-ray room, with a tentative diagnosis of fracture of the neck of the femur. The *x*-ray plates disclosed complete separation of the head of the femur at the epiphyseal line with upward displacement, outward rotation, and adduction of the femoral shaft (Fig. 54).

After waiting several days in order to permit the lacerations of the gums to heal, preparations were made to reduce the hip. We planned first to attempt reduction by manipulation and traction; if this failed, we should be ready to expose the site of fracture, separate the fragments with a chisel, effect reduction, and maintain position by a bone-peg if necessary. Open operation did not become necessary, however, as with the patient under ether anesthesia on a Hawley table we were able to correct the eversion and shortening in a satisfactory manner. With the extension still on and with both legs in marked abduction (Whitman position), a plaster cast was applied extending from the toes of the left foot to the nipples and including the right leg to the knee (Fig. 55).

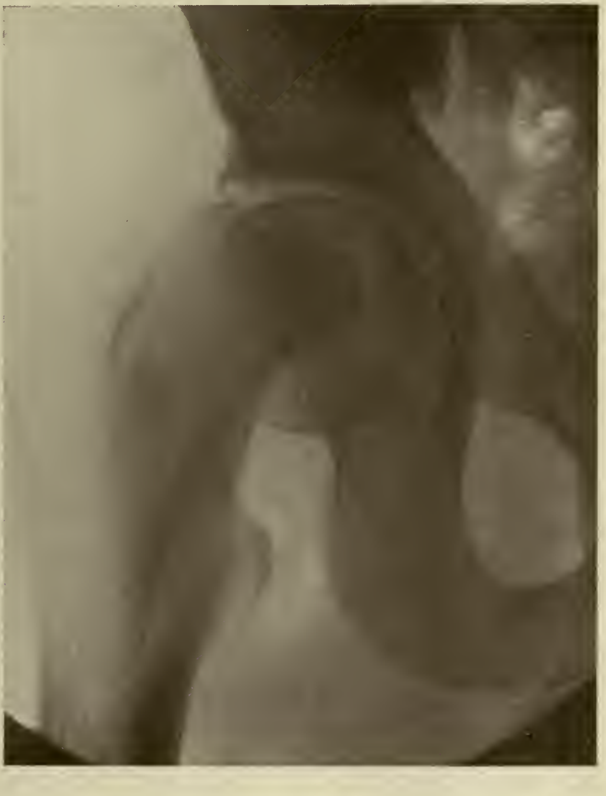

Fig. 54.—Complete separation of head of femur at epiphyseal line; note upward displacement and external rotation of femoral shaft.

After the first week the cast was removed from the right leg and the patient allowed up with crutches and a high shoe on the foot of the sound leg. Two months later the cast was removed and a new hip spica applied, extending only to the knee, with the thigh still in abduction; this cast was worn for two months, then removed, and the patient instructed to continue with the crutches and the high shoe, with especial injunction not to step on the foot of the injured side.

It is now six months since the initial cast was applied. When the final cast was removed, eight weeks ago, there was practically no motion at the hip. Now, there is 50 per cent. normal mobility, the hip is painless, and the patient can walk with a scarcely perceptible limp. The great trochanter is $\frac{1}{2}$ inch above Nelaton's line, and an *x*-ray picture discloses the fragments in good but not perfect position (Fig. 56). There is, however, about 1 inch of shortening; this may not be altogether the result of the hip lesion, for the patient's father and the father's brother each have a difference of $\frac{1}{2}$ to $\frac{3}{4}$ inch between the length

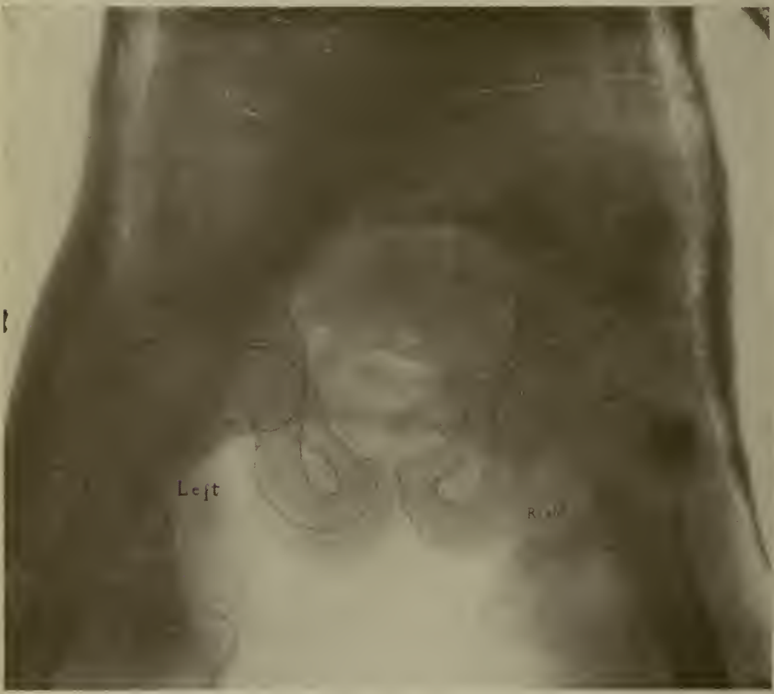

Fig. 55.—Epiphyseal separation reduced; left (affected) leg abducted at an angle of about 45 degrees, right leg to a lesser degree; position maintained by plaster spica.

of their legs. This boy is at the age when longitudinal growth is very active and it may be that the prolonged absence of function has stunted the left leg. We are not yet ready to permit unrestricted use of the limb, but shall require the patient to use a crutch on the affected side for six weeks, dividing the weight between the crutch and the leg, and return for observation. At that time we shall be ready to discard all artificial aids, but shall require the patient to report at intervals for a year in order that any tendency for the lesion to recur may be promptly met.

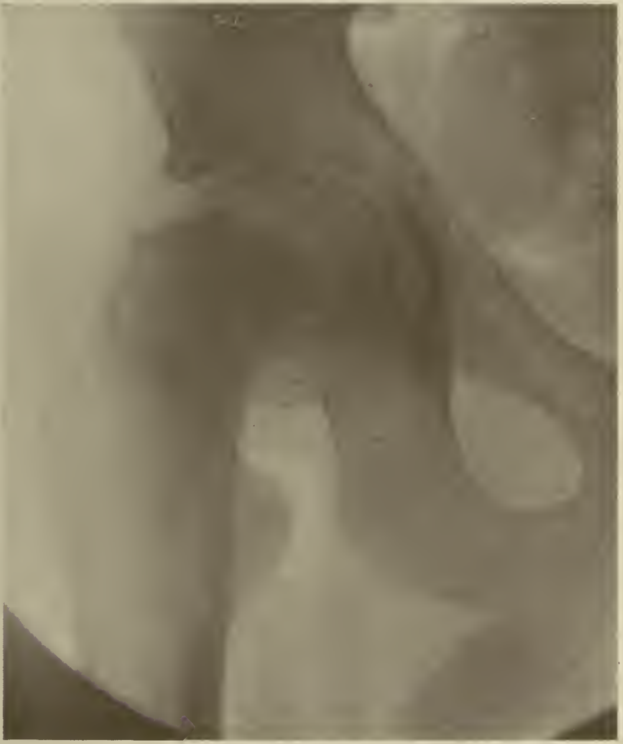

Fig. 56.—Six months after beginning treatment; limited weight-bearing to be permitted. There still appears to be some external rotation of the shaft of the femur in relation to the head.

Slipping of the femoral epiphysis sometimes follows definite, severe trauma; it not infrequently develops insidiously, particularly in fat adolescents, who present, in addition to the adiposity and the hip lesion, evidence suggestive of thyroid or possibly pituitary insufficiency.[1] In many instances, however, no features of this character are to be found. According to Whitman,[2] separation of the epiphysis in childhood is rare and requires greater violence than fracture of the neck; however, age appears to be an important factor in determining the site of the solution of continuity in these cases. Thus Taylor[3] states that the typical fracture of the neck of the femur in children up to the age of thirteen is a hinge fracture at the junction of the neck and shaft; from thirteen to sixteen years of age the typical injury is a fracture at or near the epiphyseal line, with marked displacement; after sixteen the type of fracture of the femoral neck does not differ from that in adults. The onset of symptoms may be sudden, immediately ensuing on injury, but it is not uncommon for the immediate symptoms to be slight and the really serious results to become manifest only after the lapse of weeks or even, as in the case demonstrated, months. Corner[4] reported a typical case of this type:

A boy, aged fifteen years, fell while riding a bicycle and injured his hip. He took no notice of it at the time, but a fortnight later he found that the joint was becoming painful. He managed, however, to continue his occupation of house-boy for another three weeks, when, coming downstairs one morning, his leg suddenly gave way, and he found himself completely unable to move it again. He was brought to St. Thomas' Hospital (London), where he was thought to be suffering from acute epiphysitis following a previous separation of the epiphysis. The limb was slightly flexed, with marked eversion. Any attempt at movement caused great pain. Temperature was 101° F.; pulse, 100.

An open operation was performed the same night, and the joint exposed through Murphy's incision. The capsule of the joint was found to be edematous, and the joint itself was filled with old, dark blood. No actual pus was seen. There was a partial separation of the epiphysis, which was, at the time of operation, firmly joined to the shaft except at one point, where the neighboring bone was eroded. The blood was removed, the wound was stitched up in the usual manner and drained for two days; it healed without reaction. The leg was put up in extension, later replaced by splints, to be left on for six months before allowing free exercise of the joint.

It is probable that in many instances the primary trauma merely "starts" the epiphysis, and even the most painstaking *x*-ray examination may fail to disclose signs of separation. As weight bearing continues, however, the neck gradually slips upward, pain becomes more marked, and eventually complete disability results, either appearing suddenly, as in Corner's case, or developing gradually as in the patient presented. Separation need not be absolute in order to cause complete disability; separation to a degree such that further weight bearing causes perceptible motion at the weakened epiphyseal line may be a cause of pain sufficient to be disabling.

The result of slipping of the epiphysis, in neglected cases, is apt to be equivalent to that of non-union of fracture of the femur; if not that, coxa vara of extreme degree can hardly be avoided.

The treatment of this condition will vary with the stage at which it is encountered. Early, when the epiphysis is merely "started," complete cessation of weight bearing, the patient to use crutches and wear a high shoe on the opposite foot, and the hip to be further protected by a short plaster or leather spica, continued for a period of three to eight months, may prevent further trouble.

With considerable separation, the patient should be put up in the Whitman position—the affected leg in marked abduction, care being taken also to overcome the eversion deformity—according to the plan followed in the case presented. The abduction method appears to be well adapted for the treatment of cases of this type. It is based on the idea that as the leg is abducted, the inferior portion of the capsule acts as a splint preventing the fragments from sagging, while the strong adductors are drawn taut, thus forcing the fractured surfaces into intimate contact. To obviate the possibility of the fragments overriding Cotton[5] impacts them with a mallet before abducting. The abduction method avoids contracture with adduction deformity which is an occasional sequel of treatment by other methods. It should always be preceded by correction of the deformity by rotation and traction.

In cases in which union has occurred with coxa vara, open operation attacking either the neck of the femur or the shaft just below the trochanter major, offers the only hope of cure. One may be content with simple osteotomy, or consider the more extensive procedure involved in section of the neck and insertion of a bone-peg.

Several operators have removed the head of the bone, particularly in the treatment of the second stage of the disease. It is difficult to see how such a procedure may be justified in view of the possibilities of treatment by more conservative measures.

BIBLIOGRAPHY

1. Cole-Boisse: J. de Med. de Bordeaux, 1914, xliv, p. 179.
2. Whitman: Annals of Surgery, 1897, xxv, p. 673.
3. Taylor: New York State Jour. of Medicine, 1917, xvii, p. 508.
4. Corner: Med. Press and Circular, 1914, n. s. xcvi, p. 723.
5. Cotton: Boston Med. and Surg. Jour., 1914, clxx, p. 718.

CLINIC OF DR. GOLDER L. McWHORTER

PRESBYTERIAN HOSPITAL

CIRCUMCISION: TECHNIC OF LOCAL ANESTHESIA

Summary: Liability of sloughing if anesthetizing solution is not properly prepared and injected; nerve-blocking preferable to local infiltration; technic.

WHILE circumcision is a comparatively minor operation, particularly in the infant, bad results do occur. These results may be due to improper removal of the prepuce, to infection due largely to lack of after-care, and to the anesthetic.

I want to emphasize the importance of the careful choice and use of the local anesthetic, especially in circumcision, but also in any region having a poor blood-supply. My reasons for this emphasis are due to the fact that small or large areas of skin may slough in the region of infiltration. I have had this occur following the use of $\frac{1}{2}$ per cent. apothesine both with and without the addition of epinephrin; therefore it is not due to the latter. The solutions have been properly and freshly prepared, sterilized, and other sources of possible error in technic eliminated to the best of my ability. I have seen this similar result by other men and feel that a word of caution may be opportune. This devitalization evidently does not occur where there is a good blood-supply; in such areas apothesine gives excellent results.

I have never seen tissues slough following extensive use of $\frac{1}{2}$ per cent. novocain or procain. The blood-supply to the prepuce and the skin in this region comes largely from terminal arteries, so that care should always be used no matter what anesthetic is used. In order to avoid the danger of devitalization I advocate the following precautions:

1. The use of $\frac{1}{2}$ per cent. procain with 1 drop of 1 : 1000 epinephrin to 15 c.c. of solution.

2. Operating without the use of a constrictor at the base of the penis.

3. Injection under slight tension and the use of a minimum amount of anesthetic solution.

4. The choice of nerve-blocking anesthesia over the infiltration method where possible.

5. Care in preserving the blood-vessels from injury by the needle and careful hemostasis.

6. Careful asepsis and frequent postoperative dressings.

I will use the nerve-blocking method in this case, as I prefer it in all adults.

Technic.—The area is shaved and prepared as for any operation by the use of soap and water, followed by bichlorid of mercury solution in this region, since alcohol is very irritating.

Sterile sheets are draped and the base of the penis exposed. A small wheal is first made in the skin at the back, and the needle put in, and then a wheal made from beneath the skin on each side of the base. The two large dorsal nerves and their branches are anesthetized by injecting below the deep fascia over the corpus cavernosum a little to one side of the midline (Fig. 57, 1). A small hypodermic needle is preferable for this purpose. I now inject subcutaneously all around the base of the penis (Fig. 57, 2). It is usually necessary to wait from five to ten minutes for complete anesthesia. Occasionally there is a little pain along the frenum, which may be overcome by the injection of a few drops, subcutaneously, at this point.

I now pick up the prepuce opposite the frenum with two hemostats, decide how much skin should be removed, and cut down the dorsum with a pair of scissors to this point. I stop the outer skin incision here and keep on cutting the inner layer of skin to within about $\frac{1}{4}$ inch of the corona glandis. I usually place one suture in this angle to join the inner and outer layers of skin at this point. With the two hemostats stretched out and a third forceps on the prepuce distal to the frenum I trim off first one side and then the other, cutting away the prepuce at the line I think the outer skin should be cut. This is always obliquely, cutting off a very little from the anterior or frenum side, and occasionally none at all.

The outer skin is pulled down a little, and if the inner layer next to the glans is longer than ¼ or ½ inch, I trim it off. There are usually several blood-vessels to be tied. The two edges of skin are now joined accurately by interrupted plain catgut sutures. A continuous suture should never be used, as it will produce constriction. A loose dressing is now placed around the suture line. In infants a small amount of vaselin on a piece of gauze protects the glans and may be changed with the clothes.

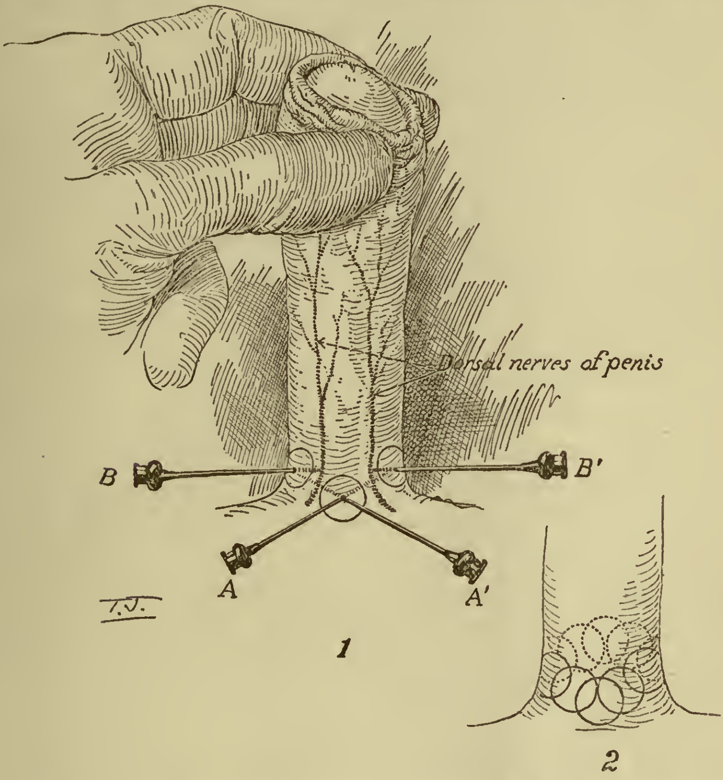

Fig. 57.—The three wheals are made by needles *A* and *A′*. The dorsal nerves are blocked by the needles passing beneath the fascia at *B* and *B′*. 2 illustrates the zone of infiltration which encircles the base of the penis after the injections have been completed.

The patient should keep off his feet for the next twenty-four hours and he will be given a dose or two of sodium bromid. An ice-cap may be applied if necessary.

ARTHROTOMY OF THE KNEE-JOINT UNDER LOCAL ANESTHESIA FOR REMOVAL OF THE MEDIAL MENISCUS

Summary: A patient with the signs and symptoms of rupture of the medial meniscus of the knee; mechanism of the production of this lesion; operative technic and postoperative care.

Few people realize the possibilities of local anesthesia and the particular operations where perfect anesthesia may be easily obtained. I will demonstrate its use in arthrotomy for removal of the medial meniscus of the knee-joint, and wish to state that it is very satisfactory both for the operator and the patient. I am using $\frac{1}{2}$ per cent. procain with the addition of 2 drops of 1: 1000 epinephrin to 1 ounce of solution. If the total solution for any operation is an amount to require more than 10 drops of the epinephrin, the proportion is lessened so that only 10 drops are used for the whole amount. With this dilution of epinephrin toxic constitutional or local devitalization from anemia should never occur.

This patient is thirty-two years of age. He complains of a recent sudden twisting of the left knee with a catching in the joint producing severe pain and followed by effusion. He was unable to walk for several days. He states that he has had numerous catches of this character. The first injury occurred while jumping over a bridge railing eighteen years ago. He landed on the left knee, which went out from under him. He was unable to walk for three weeks due to the effusion and the reaction. Lately he has had more frequent catches in the joint, and they have occurred with less provocation. He believes these occur usually when stepping down slightly and turning the body to the right, in this way twisting his femur and rotating it inward on the tibia. He has acute pain over the medial side of the joint, more or less limited to an area the size of a dollar, at these times followed by a painful swollen joint. It has never completely locked, but seems to catch and then slip by, causing the severe pain. He has felt a small prominence at times over the medial side of the joint in the painful area.

On general examination the findings are negative except in the left lower extremity. On measuring and comparing the two lower extremities we find that they are of equal length. The circumference of the left thigh 12 inches from the antero-superior spine is $1\frac{3}{8}$ inches less than the right; that of the left knee $\frac{1}{2}$ inch less than the right knee, and that of the left calf $\frac{1}{2}$ inch less than the right.

After careful examination and manipulation I was able to produce the catching of which the patient complains by extending the leg slowly and rotating the tibia out at the same time. Since no weight was thrown on the joint and as the movements were slow, only a slight reaction followed. Upon manipulation and rotation I was able to feel a small movable mass in the region of the anterior portion of the medial cartilage. This cannot be felt in any other region. There is no lateral movement of the knee on extension, so that the lateral ligaments are not relaxed.

The roentgenograms show no evidence of the cartilage, as is expected, nor of a loose osteocartilaginous body, but there is some evidence of osteo-arthritis, and there is a sesamoid bone in the biceps tendon on the lateral side of the joint.

Owing to the repeated attacks and the osteo-arthritis I advised operation for removal of the medial meniscus, which has probably been torn and has become a source of repeated trauma to the joint. A certain percentage of cases having osteo-arthritis due to a loose cartilage are practically cured or largely relieved by operation (Morison). If not operated, the osteo-arthritis will progress, perhaps producing a badly disorganized joint, and in some cases tuberculosis appears to have ensued.

The usual position of the leg during injury to the medial meniscus seems to be in a position of semiflexion, with rotation of the tibia or femur. Many writers (Henderson) believe that the tibia is usually everted or the femur twisted in, but Barker states that the tibia and foot were generally inverted in his cases; the cartilage may be loosened by sudden rotation of the tibia on the femur in semiflexion. Martin concludes that both an inward and outward twist may cause rupture. Walton concludes from a study of the anatomy and clinical cases that injury may be produced by forcible extension of the leg, terminating by outward rotation of the tibia upon the femur. McMurray gives a good description of the internal lateral ligament and the rather large part it plays in injury of the medial meniscus due to its intimate attachment to the meniscus.

Technic.—The patient was prepared yesterday. The whole leg was shaved and scrubbed with soap and water, followed by alcohol. The leg was then wrapped in a sterile gauze bandage. The preparation has just been repeated and the leg draped with sterile sheets.

The knee is placed over a hinge on the table so that we can let it hang down at a right angle during the operation. I will make a triangle of anesthesia so that my incision may lie inside the line of infiltration. The upper angle will be at a point just medial to the patella and about 1 inch above; the lower medial angle will be directly below this point and just below the joint line over the tibia. The third angle will be at a point on a line drawn at right angles to a line connecting the first two, beginning at the lower angle and going medianward for 1½ inches. This gives us a right-angled triangle (Fig. 58). Wheals of anesthesia are now made at these points, and they are connected first by deep injections and then by very superficial subcutaneous injections. I now make a slight incision through the skin and introduce a fresh needle just medial to the patella into the joint capsule and inject between 15 and 20 c.c. of the procain solution. I am making a slightly curved incision with the upper part parallel to the patella and about ½ inch from it. This curves down in a crescent shape so that the lower short part extends out toward the crest of the tibia, meeting it obliquely (Fig. 58). The skin incision is continued wider than the intended opening through the deeper structures, in order to clamp towels on easily and to enlarge the deeper incision if necessary without removing the towels. Towels are clamped along the edge of the skin to wall it off, and all the instruments I have used are discarded. I am also changing my gloves, as I have touched the skin while injecting the anesthetic solution. In this operation we will not

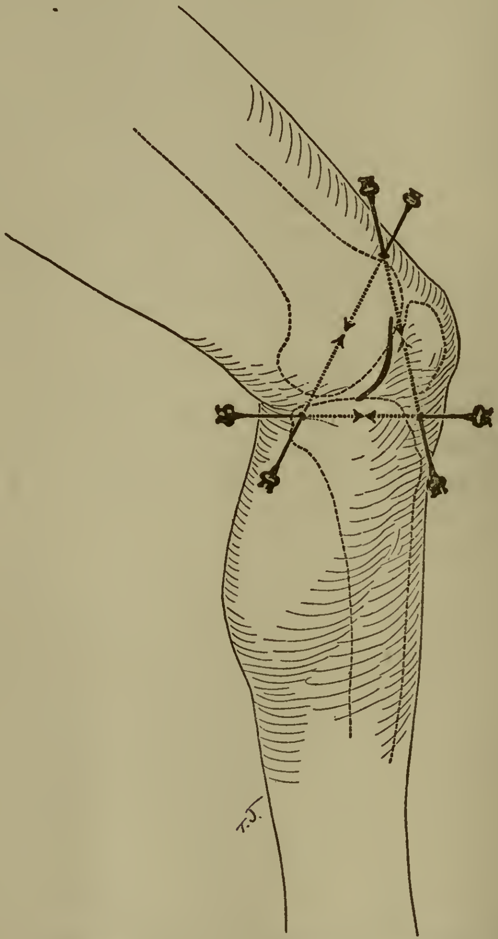

Fig. 58.—A triangular area is completely anesthetized by superficial and deep infiltration around the edges. The incision is made within the lines of infiltration.

touch anything unnecessarily and will use instruments for all our work.

There is some bleeding from the thick fat beneath the aponeurosis which we control by picking up the bleeding points and leaving a hemostat on for a few minutes. The capsule is now opened and the anesthetic solution escapes. There is no pain and the patient is perfectly comfortable.

With retractors the medial side of the joint is exposed. The medial meniscus is found to be markedly thickened and nodular at its anterior part. It is loose and has been almost completely separated at about the posterior two-fifths. I am freeing the anterior medial part where it is still attached, and then I shall remove the cartilage as far as the point of constriction which marks the location of the old tear. This removes practically four-fifths of the meniscus; the remainder may be left. The patient has not felt the removal of the cartilage. In doing this I have been careful to avoid injuring the medial lateral ligament to which the cartilage has a strong attachment. The leg may be rotated to help bring the cartilage into view if necessary. The capsule and synovia are now closed with plain catgut. I am tying all knots with instruments and my assistant uses a forceps without teeth to help me. I use a continuous suture to simplify this instrumental technic. The hemostats are removed and all bleeding has stopped. The nurse has threaded the needles with instruments and we close the aponeurosis in the same manner. It is desirable to have no ligatures and as little catgut in the wound as possible, and also to traumatize the tissues as little as possible.

The towels are now removed and the skin closed. I am using waxed linen for this layer. We have done this operation as carefully and gently as possible. I have used no constrictor, and I think the local anesthesia is a factor in helping us to do without it. The knee is carefully bandaged. While immobilization may be unnecessary and I think a circular cast undesirable, I am going to put a posterior molded splint on with the knee slightly semiflexed for one week.

Massage of the quadriceps and other muscles will be started in a few days and the patient will use his knee and walk after a week or ten days, gradually increasing its use. Regular graduated exercises to strengthen all thigh and leg muscles will be started early. I prefer the use of a cotton flannel bandage applied to the knee in the morning and removed at night, for a short time, rather than an elastic bandage, which is liable to be either too tight or too loose to be of any value.

BIBLIOGRAPHY

Henderson: Derangements of the Semilunar Cartilage of the Knee-joint, Minn. Med. Jour., II, 138, 1919.
Martin: Proc. Royal Soc. Med., vol. 6, Surgical Section, p. 23, 1912.
McMurray: Brit. Jour. of Surg., January, 1919, vol. 6, No. 23, 377.
Morison: Injury to the Semilunar Cartilages of the Knee, Lancet, I, 604, 1909.
Walton: Injury to the Semilunar Cartilage, Proc. Royal Soc. Med., vol. 6, Surgical Section, p. 1, 1912.

CLINIC OF DR. CHARLES MORGAN McKENNA

University of Illinois, Department of Genito-urinary Surgery

CYSTS OF THE EPIDIDYMIS AND VAS

Summary: A patient complaining of pain in the left inguinal region associated with localized swellings of the left spermatic cord; operative removal of cysts, one from the vas and one from the epididymis.

Mr. R., twenty-four years of age, entered the hospital three days ago suffering with pain in the left inguinal region, radiating toward the testes. This pain is not of a severe type, but more of a chronic nature, becoming worse at the end of the day after he has done a hard day's work. He also complains of a swelling which is more noticeable in the evening than at any other time. He gives a history of having injured this particular side some three or four years ago, since which time an abnormal swelling has been constantly present.

You will remember that varicocele usually occurs on the left side, but on careful examination this patient shows no varicosities on either side. He has, however, two very well-defined, small, movable tumors. One appears to be attached to the head of the epididymis, while the other is connected with the cord proper. It is impossible to tell the character of these tumors. They may be cysts or other benign growths. I do not consider them either malignant or tuberculous.

We will put the patient to sleep in the usual manner and make an incision about 2½ inches below the external inguinal ring, thereby exposing the cord. We can easily push the epididymis into the field of operation. You notice this is a very bloodless operation and the cord is very easily exposed. The first step is to expose the vas in order to lift it out of the way to avoid injuring it. We always make that a very definite point in doing any cord operation. The vas is lifted out with two blunt hooks and held in position with sterile gauze. The vas is easily recognized by its whipcord-like consistency. You notice that while dissecting the vas from the cord we come right down to the tumor. This tumor is a little different from what I expected, inasmuch as it is attached to the vas proper. The sheath that covers the vas also covers the little tumor. This case demonstrates very well the necessity of having the vas well dissected out in doing vasotomy. This sheath should be given particular attention because it is so much easier to inject the sheath than the vas. It is impossible to inject the vas without dividing the sheath with a scalpel, since the needle will usually go between the sheath and the vas proper. We will now dissect out this little tumor, which is connected to the vas proper underneath the sheath by a very small connective-tissue pedicle.

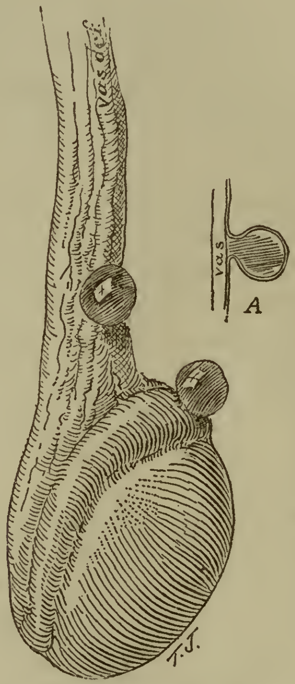

Fig. 59.—Cysts of the vas and epididymis discovered at operation.

This tumor is about the size of a double coffee bean and apparently contains a gelatinous fluid.

Through the same incision we will expose the tumor of the epididymis. I find this is attached to the head of the epididymis by a fine connective-tissue pedicle. It is of about the same consistency as was the tumor on the vas, but a little larger in size. Both tumors have given the patient considerable pain for the reason that they lie in the canal of the ilio-inguinal nerve. This is very well demonstrated in this case. You notice by pushing these little tumors they come in contact with the ilio-inguinal nerve. The patient stated in his original history that when he was in certain positions the pain was really excruciating, showing the relation between the tumors and the nerve. These cases are not at all uncommon. If careful examination is made of all cases suffering with varicocele, one will often find these little tumors attached to the cord or epididymis. They seem to be secondary to some previous injury. The dissection can be made very cleanly, and the patient usually has an uneventful recovery (Fig. 59).

The specimens will be sent to the laboratory for final examination. The wound is closed in the usual way without drainage. The scrotum will be put in suspension and the patient will be kept in bed for about three or four days, at the end of which time the stitches will be removed.

HYDROCELE AND AMPUTATION OF THE SCROTUM

Summary: Diagnosis of hydrocele; etiology; treatment—the bottle operation; amputation of redundant tissues—prevention of postoperative hematoma.

This is an interesting case from the standpoint of the size of the lesion. There is no question as to the diagnosis. The lower part of the scrotum is 4½ inches above the knee (Fig. 60). On examination with a transilluminating light the entire mass is transparent, which makes the diagnosis of hydrocele very evident. Evidently this man has carried this condition for a very long time. He gives a history of venereal disease some ten years ago.

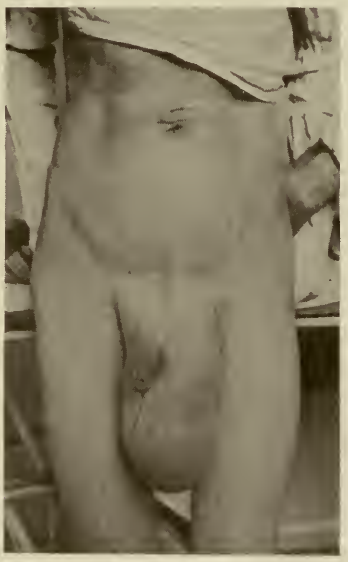

Fig. 60.—Before operation. Note huge distention of scrotum by hydrocele.

I have mentioned many times before in this clinic that all cases of acute epididymitis have associated with them a beginning hydrocele. If these cases are not properly cared for at the time of treatment or operation we get the result we see in this patient. The fluid has been gradually accumulating here for years, and the patient acknowledges that he would not have reported to this clinic for operation were it not for the inconvenience he suffers from the large size of the scrotum. He carries a special bag made for the scrotum and has done so for a number of years. You will notice that the fluid is present not only in the scrotum, but extends fairly well up on the abdomen, so high that it is impossible to introduce a finger into the external inguinal canal. I mention this because it is not uncommon to find a hernia in conjunction with a hydrocele. It behooves us to be very careful in opening the tunica vaginalis that we do not find a loop of bowel present. It is, therefore, always very necessary for us to try and find out before operating whether or not a hernia is present. While I am quite sure there is no hernia in this case, we will take pains in opening up the tunica vaginalis and will open it fairly low down. We will do the invagination or bottle operation which you have already seen demonstrated in this clinic. You notice after the skin is incised that the thin layers of fascia are very dense. We will let this fluid drain into a jar and have it measured. We will cut off a part of the tunica vaginalis so as not to make too thick a mass posterior to the epididymis; we trim off three-fourths of the sac, closing up the remainder in the usual manner. You will notice that even after doing the hydrocele operation the man has an extremely long scrotum. This would be, of course, a hindrance to him afterward. While he is under the anesthetic I think it is well to do an amputation of the scrotum. I would like to have you pay particular attention to the method used here.

We first put two clamps on the lower portion of the scrotum and expand it as far as possible. We will introduce a rubber-mounted curved forceps to clamp off the scrotum, with the testes well elevated. We also keep tension on the lower portion of the scrotum and will excise about $\frac{3}{4}$ inch below the rubber-mounted forceps (Fig. 61). This seems to leave a fairly long scrotum, but you remember that the testes are well elevated on the abdomen, and when replaced the sac will be about normal size.

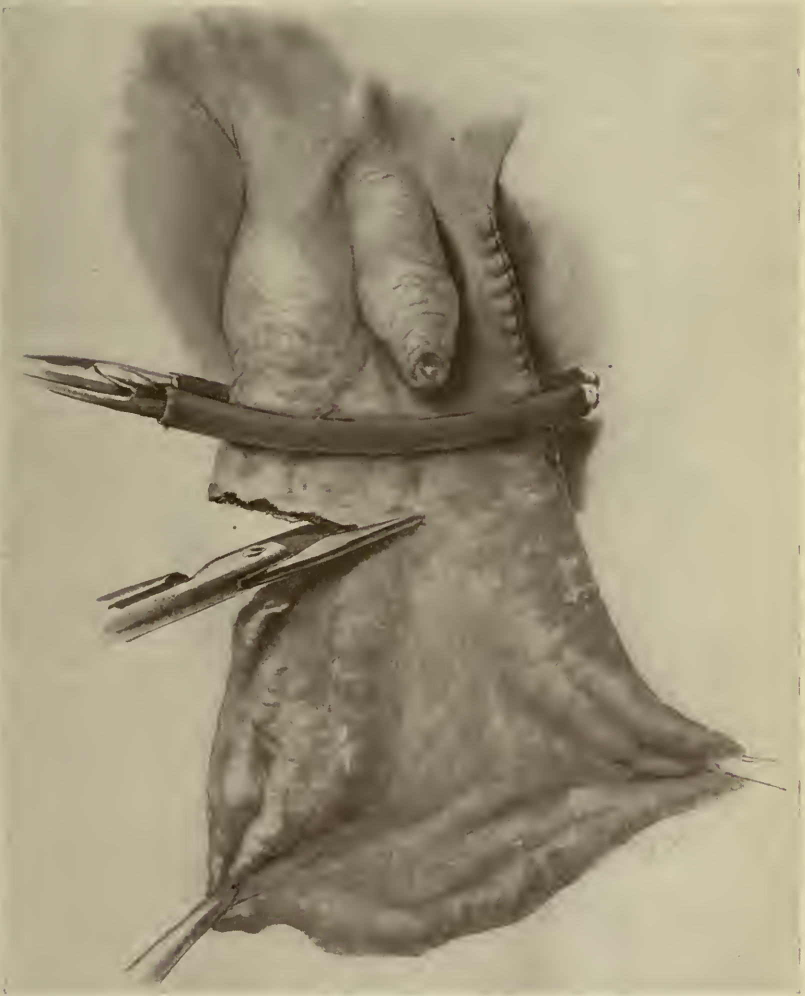

Fig. 61.—Removal of excess scrotum after operation for hydrocele. Great care is taken to suture tunica dartos separately from the skin in order to prevent postoperative hematoma.

The incision is made in this manner in order that we may be able to pick up the tunica dartos separately from the skin.

That is the most important part of the operation, because suturing the tunica dartos and skin together gives us a most unsatisfactory result. It is not uncommon in putting the suture through the skin that we do not catch the tunica dartos, owing to the fact that the tunica has slipped up, with the result that a hematoma into the tunica or scrotum is produced following

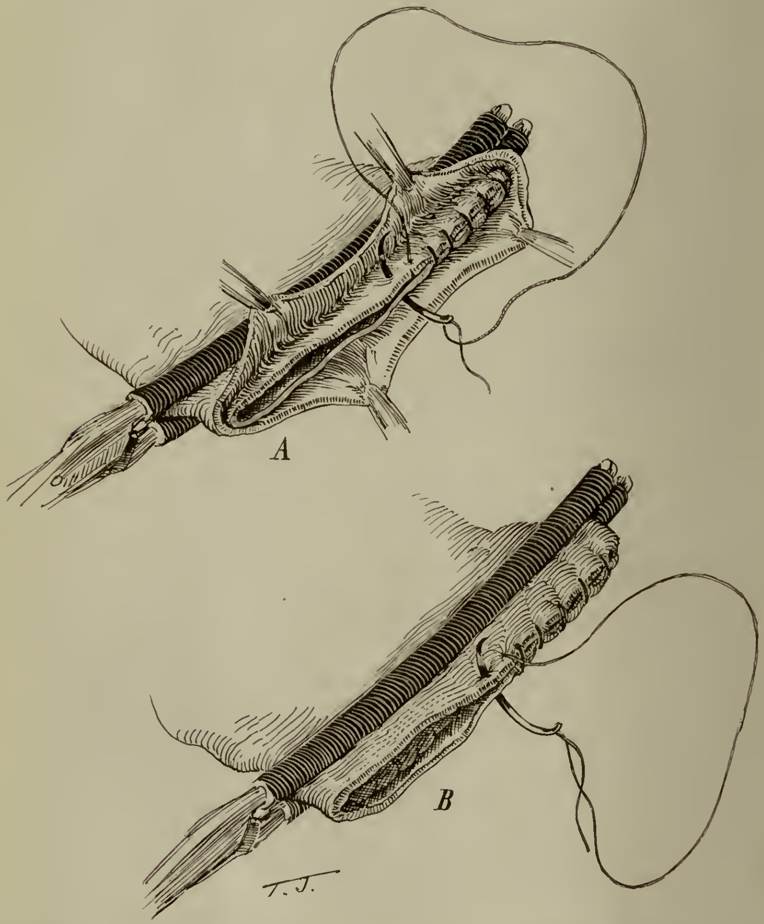

Fig. 62.—Removal of excess scrotum after operation for hydrocele. Great care is taken to suture tunica dartos separately from the skin, in order to prevent postoperative hematoma.

operation. This is a common occurrence where the tunica dartos and skin are sutured with the same running suture. We reflect the skin and pick up the tunica dartos separately, in order to avoid hemorrhage afterward (Fig. 62, *A*). I cannot lay too much stress on this particular point. Ordinarily No. 2 catgut is used for the tunica dartos and either horsehair or silkworm-gut for the skin (Fig. 62, *B*). We are closing this wound without drainage.

The patient will be presented at this clinic in three weeks to show you the result of this operation. It is peculiar that the scar in the scrotum rarely shows, and unless one actually knew that an operation had been performed he would not be likely to suspect the fact from inspection of the scrotal skin.

SARCOMA OF THE BLADDER

Summary: A tumor of the bladder, clinically papilloma, removed by fulguration, recurring as an infiltrating growth in the bladder wall. Technic of resection of tumor and transplantation of ureter. Pathologic diagnosis.

This patient was admitted to the hospital about one month ago complaining of blood in the urine. She stated that the blood appeared periodically. I have often said that blood appearing in the urine is always symptomatic of something that should be looked after and cared for immediately. She remembers back as far as eight months ago of noticing blood for the first time, and has gone on as patients usually do thinking or hoping that the blood would disappear. In fact, she has consulted some physicians, who gave her, as far as I can learn, urotropin or some other internal remedy.

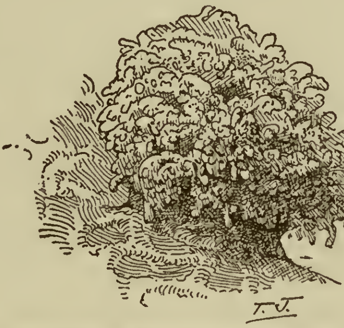

Fig. 63.—Papilloma of the bladder before treatment.

On cystoscopic examination after her arrival at the hospital we found on the left side involving the left ureteral orifice a very well-defined papilloma of the bladder (Fig. 63). It had all the marked characteristics of any tumor of this kind, and on one of the little projections could be seen the place where the hemorrhage had occurred. The tumor was, I would say, ½ to ¾ inch in height, having a pedicle ⅛ inch thick at its base. At this time we fulgurated the tumor, with excellent results. She suffered scarcely any inconvenience and had no hemorrhage. The fulguration was repeated four times at intervals of five days.

I examined this woman yesterday; the bladder still continues to look very red and angry at the site of the tumor, and it is my opinion that in the mucous membrane or muscularis of the bladder we will find a very marked tumor. Consequently, I am going to make a suprapubic opening, remove the tumor, and do a transplantation of the ureter on the left side.

The first step is to fill the bladder, and you see that this is being done very easily. We always make a point of this, because it is so important to have the bladder well filled, not only for the purpose of distention but also to throw the peritoneum well back out of the suprapubic space. Some one has asked what fluid we use in distending the bladder. Plain water is usually used, though sometimes we employ a weak silver solution, as argyrol, collargol, or protargol. We find that plain water is as good as any solution, provided you have a clean bladder, which this woman has.

The patient is put to sleep in the usual manner with nitrous oxid gas, which will be followed by ether. This operation can be done very satisfactorily under local anesthesia, but owing to the nervous condition of the patient and the previous treatments she has had with the fulgurating machine we hesitate to employ a local anesthetic in so extensive an operation.

We will make a median incision, starting at the pubes and running back about 3½ inches. You notice we split down just the same as in doing a laparotomy and come well into the prevesical space. We have only three bleeding vessels, which we are tying off. The peritoneum can now be pushed back very readily with a sponge. The question is often asked: How may we recognize bladder tissue when there is a great deal of fat present? This is very readily done by pushing the fat off the bladder and examining the bladder wall, which is always well supplied with blood-vessels. We always make a practice of removing the fat from the bladder, because it gives us a clean surface in which later to introduce our sutures, and also does away with the danger of necrosis of fat tissue, which occurs so rapidly when the circulation is cut off. This bladder surface is one of the best habitats for bacteria when it comes in contact with urine.

We will now introduce two guy-rope sutures into either side of the median line of the bladder to hold it up. You remember the catheter which was inserted into the bladder at the beginning of the operation was clamped with an artery forceps. This forceps is now released, and the water which distended the bladder is permitted to escape, leaving the abdominal wound in normal condition. The bladder is now opened while the assistant holds each guy-rope in position. With the incision down to the pubes and with retractors well in place I think every one can see the tumor on the left side. On introducing my finger into the bladder I find we have a very well-defined tumor about 1½ inches in diameter. The tumor is hard and cartilaginous. It lies a little below the ureteral orifice, but includes the ureter at its upper margin. We are going to do a very complete resection of the tumor and the ureter.

We shall go through the muscularis of the bladder, but I shall hold both margins intact by introducing a suture at the lower angle of the incision before removing the mass. In that way we can control hemorrhage and keep our approximation perfect. The incision is carried well up, so the upper angle is above the ureter. You notice that the entire incision is elliptic in form. The ureter is picked up and held out of the field (Fig. 64, 1, 2). You remember that the ureter lies under the mucous membrane of the bladder for some distance in the bladder wall before taking its upward course. The ureter is not difficult to locate by virtue of its size, which is about that of a large piano-wire. I will place one fine chromic catgut suture through the lower portion of the distal end of the ureter and hold it in place, to be used later in the transplantation. We will now continue the removal of the tumor. We have dissected well out into the healthy tissue of the bladder. In that way we hope to do away with any metastatic growth. Remember, I am not saying that there will be no recurrence of the tumor, but I think

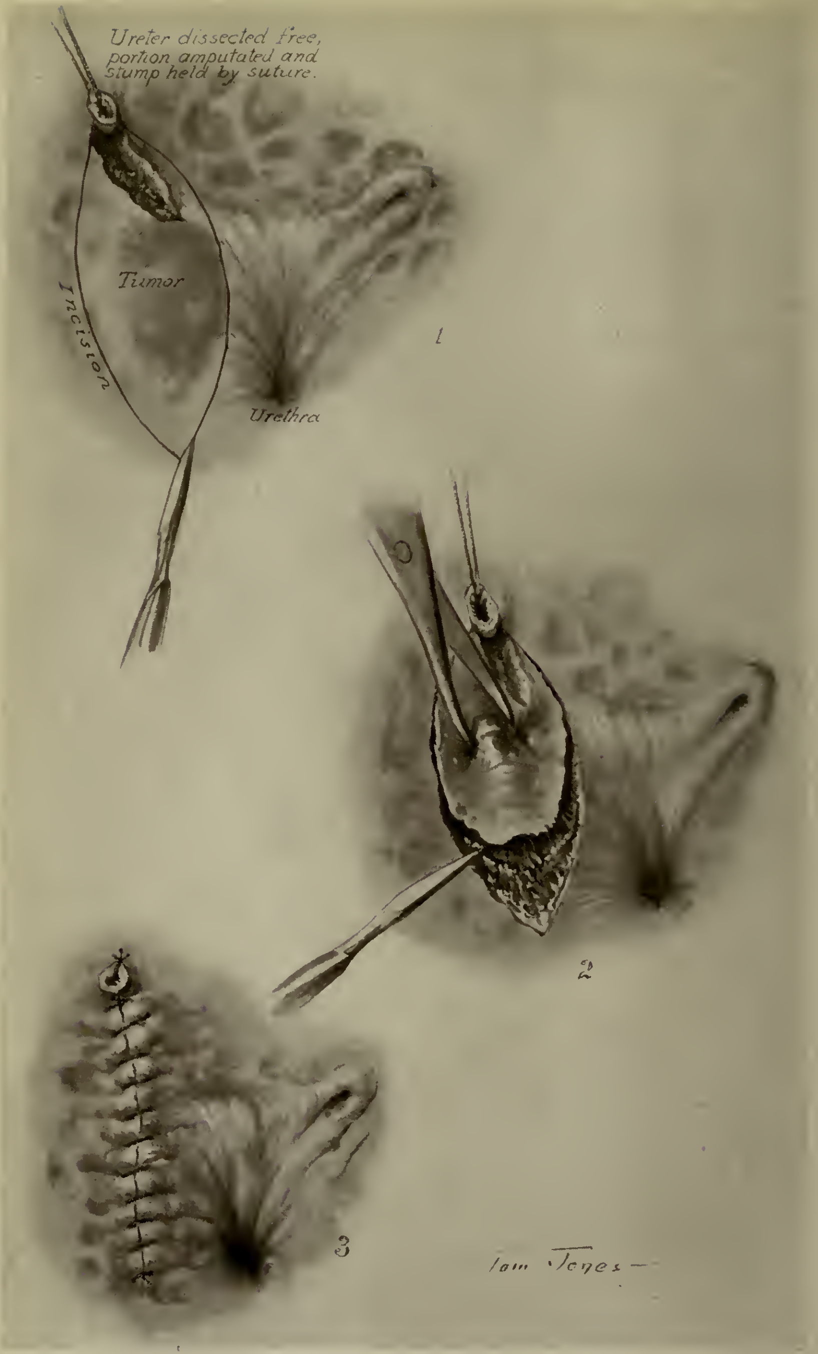
Ureter dissected free, portion amputated and stump held by suture.
Tumor
Incision
Urethra
1
2
3
Tom Jones

Fig. 64.

it is well when one is in the bladder to do as radical an operation as possible where malignancy is suspected.

Some one has asked what suture material is used in the bladder. We usually use twenty-day chromicized catgut. A few sutures are all that are required in doing this kind of work; in fact, just enough to make complete the approximation of the mucous membrane. The more sutures that are introduced, the more likely is one to have infection. We cannot lay too much stress on the fact that as little catgut as possible should be used.

We will now pick up the cut end of the ureter and place it in the upper angle of the bladder. We made the incision elliptic and carried the angle well up into the bladder so as to get into healthy tissue. One suture is all that is necessary to hold the ureter in place. The wound will be closed on the inside with interrupted catgut sutures (Fig. 64, 3). We will put in a large rubber drainage-tube just as we do in our cystotomy or prostatectomy cases. Again we emphasize the necessity of closing the bladder well up to the rubber tube in order to prevent leakage of urine into the perivesical space, which is one of the natural chambers of infection after bladder operations. The muscle, fascia, and skin are also closed in the same way up to the tube. The tube is now cut off $1\frac{1}{2}$ inches above the skin and a right-angled glass tube is put inside the rubber tube well down into the bladder. By so doing the rubber tube will not bend on itself and cut off the drainage. Attention to the immediate after-care is important in this class of cases. We feel that, barring infection, this wound will be just as clean and the skin around the incision just as clean as in an ordinary abdominal wound. The tube will be left in for six or seven days, or just as long as it serves as a drain to allow primary union to take place up to the tube. It does away with the danger of infection or stitch abscess.

Note.—The specimen was examined by Dr. William H.

Fig. 64.—Excision of sessile tumor in bladder wall four weeks after fulguration for papilloma. The ureter is transplanted into upper angle of incision.

Burmeister, Pathologist to St. Joseph's Hospital. His report is as follows:

"*Gross Description.*—This is a low, nodular tumor. There are no pronounced papillæ. The dimensions of the tumor are 2 x 3 x 3½ cm. The mucosa is grayish-red in color, some of it beginning to slough, leaving a few shaggy shreds adherent. It is apparently an epithelioma.

"*Microscopic Description.*—The section presents the characteristics of a large spindle-celled sarcoma with much intercellular papillary material. There are groups of polymorphonuclear leukocytes and round-cell infiltration, sometimes perivascular in location, more often irregular in their distribution (Fig. 65).

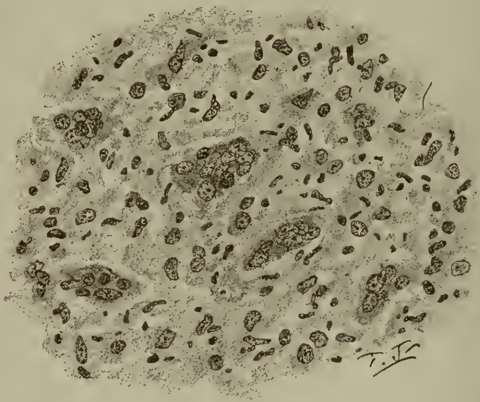

Fig. 65.—High-power drawing of portion of tumor. Note infiltrating columns of tumor cells in the inflammatory tissue.

"*Diagnosis.*—Large spindle-celled sarcoma of the urinary bladder with chronic inflamation."

COMMENTS

Legueu, in Traite d'urologie, states that sarcoma of the bladder is of rare occurrence, Rafin having collected only 55 cases. It occurs more frequently in women than in men, and mostly in early childhood and middle age.

The sarcoma grows in the mucosa, is sessile, and rarely becomes pedunculated. The maximum size attained by the tumor is about that of an English walnut. The surface is smooth and rarely villous, the color rosy red, and the consistency hard and cartilaginous.

The tumor is generally situated in the base of the bladder in the neighborhood of the ureter. In some cases Legueu observed that the tumor infiltrated the vesical wall around the point where it was implanted, and even perforated the wall, extending toward the pelvis.

The tumor metastasizes to the bony parts, the prostate, and the iliac vessels. Secondary nuclei are produced in the lungs, liver, and spleen.

Legueu found that histologically the tumors, except in 3 cases of melanosarcoma, were spindle-cell and embryonic sarcoma. The tumor is covered on its surface by bladder epithelium.

CLINIC OF DR. CAREY CULBERTSON

PRESBYTERIAN HOSPITAL

LIGAMENT SHORTENING IN THE TREATMENT OF RETROFLEXION OF THE UTERUS

Summary: Pathology resulting from uterine retroflexion and retrodisplacement. Backache as a result of uterine displacement. Technic of dilatation of the cervix and exploration of uterus. Amputation of the cervix. Shortening of the round ligaments—surgical anatomy involved—technic of the Webster method—theory of the operation—necessity of shortening the uterosacral ligaments as part of the round ligament operation; postoperative management—the question of subsequent pregnancies; technic of abdominal closure.

THE case for demonstration this morning is that of a woman thirty-four years of age, occupation housewife, who enters the hospital complaining of excessive menstrual flow and backache.

She has been married ten years, during which time she has given birth to 4 children, all of whom are living and well. The labors were spontaneous and the puerperia normal, with the exception of the second. After her second labor she was sick for six weeks, suffering from chills, fever, and pain in the pelvis. Recovery from this attack was spontaneous after rest in bed; that is to say, there is no history of any operative interference at that time. In addition to the 4 full-term pregnancies there is a history of two miscarriages, both occurring in the early weeks. In one of these the normal period was missed but a few days, followed by somewhat more profuse bleeding than usual, so that there is fair reason to doubt that one of these at least was a miscarriage.

Menstruation began when the patient was sixteen years of age, and occurred regularly every twenty-eight days, lasting six or seven days each time, and was usually free in amount. Previous to her first confinement she had moderate dysmenorrhea characterized by cramp-like pains occurring before the flow was established. Her last period occurred from the 18th to the 24th of July, 1919. On August 7th she began bleeding again, and has bled moderately but continuously until the present date (August 22d). There have been no previous attacks of metrorrhagia, but the periods occurring at the normal time have been unusually profuse during the past two and one-half or three years.

She describes the backache as being of a dull, aching type, which is considerably worse during menstrual periods, but never so severe as to make it impossible for her to do her housework or to require that she go to bed.

Upon examination we find that this patient is a well-nourished, well-developed woman not apparently older than the age given. Physical examination of the head, neck, and chest reveals normal conditions. There is no appreciable increase in the thyroid gland or other evidence of hyperthyroidism. There is no heart lesion, either valvular or myocardial, that can be made out. The abdomen is flat, soft, and somewhat diastatic, showing only fairly perfect involution for a woman who has gone through four full-term pregnancies. There are no tender points and no masses on palpation. The vaginal introitus is narrow and the vagina is short and distensible. The cervix is multiparous, moderately thickened, somewhat rough and lacerated a short distance from the left angle. The corpus of the uterus lies in a retroflexed position and is somewhat enlarged, soft, and boggy. It is free and flexed to the right. The appendages are prolapsed, both ovaries being palpable in the culdesac of Douglas. There is some thickening on either side which appears to be in the broad ligaments close to the uterine wall. Inspection with a vaginal speculum shows that the anterior and posterior lips of the cervix are eroded.

We have here, then, a patient still of the child-bearing age, who comes to us complaining of excessive menstrual flow, recent metrorrhagia, and moderately severe backache, and who shows on examination retroversion of the uterus, prolapsus of the appendages, together with laceration and erosion of the cervix.

The thickening of the broad ligaments is, in all probability, due to the presence there of varicose veins, since these are very frequently associated with retrodisplacements of the uterus. Retroflexion of the uterus is a condition which does no great harm to the uterus itself, but which does result in bringing about torsion of the ovarian vessels with varicose development in the upper portion of the broad ligaments and the infundibulopelvic and ovarian ligaments, thus producing chronic congestion of both ovaries and of the uterus. The tubes are apparently not much influenced by retrodisplacements of the uterus, though in some cases this, no doubt, is a factor in closure of the fimbriated extremities of the tubes, with resulting development of hydrosalpinx. Hence the relation between uterine retroflexion and menorrhagia, if not metrorrhagia, is fair enough in a certain proportion of the cases.

As regards the symptom of backache, certainly it is more difficult to prove this to be the result of retroflexion of the uterus. Backache in women is due to the same factors which produce it in men, but it is also associated with pelvic disease in some degree. While the displacement itself of an otherwise normal uterus should not be a factor in backache and probably is not such, nevertheless the development of varicose veins in the pelvic ligaments undoubtedly does cause pain of a dull, aching type, just as varicose veins elsewhere in the body produce pain, and this no doubt is frequently referred to the lumbar or sacral regions. I am satisfied in my own experience that pelvic varicosities which are so frequently seen in women have been regarded as of entirely too little importance as a factor in producing the symptomatology complained of. Certainly the results following operation in cases such as this one, in the relief of the symptoms, encourages us to continue the plastic procedures that are being used to overcome displacements of the uterus.

In this patient the leukocyte count shows 5700 leukocytes and the hemoglobin estimation is 85 per cent. The urine is normal.

As a preparation for the shortening of the round and uterosacral ligaments, which I propose doing in this case, it is well first to dilate the cervix for the purpose of exploring the uterus and to treat the erosion of the cervix. We will, therefore, take this up first. It is true that years ago Sinclair showed that cervical atrophy and erosion usually disappeared after reposition of the displaced uterus. However, inasmuch as we cannot be certain of that, there is no reason why we should not treat this condition at this time. Incidentally, too, we should explore the uterus for the purpose of ascertaining if any condition may exist there which might be the cause of the metrorrhagia, such as, for instance, a mucous polyp or a small submucous fibroid.

In dilating the cervix a hanging speculum is first placed in the vagina and lateral retractors are introduced. The cervix is grasped with a volsellum and brought down as far as it will come. In this case the cervix comes well down to the vaginal introitus, indicating that the uterus is free and that there is considerable relaxation of what is called the pelvic floor. A second volsellum is then used to grasp the anterior cervical lip well over toward the left angle. The first volsellum is reintroduced well over toward the right angle. In dilating the cervix I prefer to use two double-tooth volsella instead of one four-tooth volsellum, for the reason that much better traction can be obtained with less damage to the cervix. No operator can tell whether a cervix is going to dilate readily or with difficulty, and with two volsella placed in this way there is much less danger of them pulling out and thus lacerating the tissues. I introduce a uterine sound, in this case upside down, and measure the depth of the uterus. The sound shows that it is $2\frac{3}{4}$ inches deep. This is normal enough for a uterus that has gone through four full-term pregnancies. The dilatation itself is effected by the use of graduated dilators of the Hegar type. These are passed one after the other, care being taken not to omit any one, since it is difficult to pass, for instance, from a No. 3 to a No. 5, omitting No. 4. The dilatation is effected slowly, great haste being avoided, as the cervix is a musculoconnective tissue structure and does not yield readily to dilatation. For the same reason in dilating it the tissues must be spread in all directions, not merely laterally or anteroposteriorly. That is why I prefer the Hegar dilators to the Goodall. The dilatation in this case is effected readily, the sounds passing into the cervix without great difficulty up to No. 15. For gynecologic inspection No. 15 is generally sufficient. Only in obstetric cases, such as incomplete abortions, is it necessary to dilate the cervix beyond No. 15.

Inspection of the uterus is now made with a curet forceps. This, as you see, is a long slender forceps with a round blunt tip that can be readily introduced. It shows that there are no growths in the uterus, and no material such as would be present in a case of incomplete abortion, which must never be forgotten in a case of metrorrhagia such as this patient has recently passed through. We find no mucous polyp and no submucous fibroid. Palpation of the uterine cavity may be done with the finger. I have no difficulty in passing my little finger through the cervix. For this purpose, too, I use a large sharp curet, the same as is used for scraping out portions of the mucous membrane. I pass it lightly over the cervix and get a fine grating sensation, which is evidence that the mucous membrane is normal. If it were hyperplastic it would bleed more readily than this has done and the sensation would be soft and velvety instead of grating. This enables me to make out more accurately the presence or absence of new growths. Curetage, as such, is not indicated in this case, and will not be performed.

I now make an application of tincture of iodin to the mucous membrane. This is done with two applicators, one for the cervix and one for the corpus, and the iodin is rubbed in vigorously. No gauze pack or drain is introduced.

The cervix which has been under inspection shows considerable thickening and a small amount of eversion, with rather marked erosion of both lips. This is most quickly and most radically treated by amputation. In amputating the cervix I will follow essentially the same technic as described in my clinic two months ago (Surgical Clinics of Chicago, October, 1919). The anterior cervical lip is grasped with one volsellum forceps, the posterior lip with a second, so that the two lips are held apart. The cervix is then split laterally $\frac{1}{2}$ or $\frac{5}{8}$ inch with the scissors. The anterior lip is treated first, and the outer vaginal mucous membrane is cut through with a scalpel from the right lateral incision to the left in a direction slightly curved downward. This curved flap of vaginal mucosa is then dissected free as far up as the two lateral incisions extend. The cervical lip is then amputated with a sharp knife passed from within outward, the incision going from one side to the other and running backward. With chromic catgut we now stitch the reflected portion of the vaginal mucosa down over this raw cervical edge, bringing it exactly to the edge of the cervical canal. Two over-and-over sutures are sufficient for this, and are left long and held by a clamp to be used as tractors. In this way we avoid the formation of scar tissue in the cervical wall, which results from some of the older methods of amputation. The posterior lip is now amputated in the same way, and the vaginal mucosa is drawn over this raw edge exactly as before. This leaves a gaping angle at each side, where one or two over-and-over catgut sutures are sufficient to coäpt the cut mucous edges. These sutures are cut short and a narrow gauze strip is now lightly inserted into the cervical canal to serve merely as a surgical dressing for the new cervical lips. The long sutures in the anterior lip are cut and the cervix allowed to fall back in the vagina. This piece of gauze in the cervix is long enough so that it can be packed down lightly in the vagina, after which it is cut off at the vaginal introitus, to be removed in twenty-four hours.

In this particular case there is no relaxation of the vaginal floor of the perineum and no perineorrhaphy will be required. Where, however, there is relaxation it is absolutely essential that a good, firm perineum be created as a preparation for the shortening of the round ligaments as practised for retrodisplacements of the uterus.

The patient is now placed flat on the table and prepared for abdominal incision. After the skin and subcutaneous fat have been incised from just below the umbilicus to within three fingerbreadths of the symphysis, the fascia is cut through. The recti are then dissected from their sheaths for the entire length of the wound. The patient is now tipped into the Trendelenburg position, the peritoneum is opened, and self-retaining retractors are placed in position. With the patient in this position, the intestines having fallen back toward the diaphragm, a wide gauze pack is introduced gently but thoroughly, packing off the pelvis from the abdominal contents. You see the anterior wall of the uterine body, the fundus lying deep in the pouch of Douglas. As we lift it up it gives us the impression of being enlarged, soft, and boggy, but absolutely free, there being no adhesions at any point. A double-toothed volsellum is introduced into the posterior wall just below the fundus of the uterus for the purpose of holding the uterus upright. Both tubes are seen to be straight and free. Both ovaries are free and moderately cystic, the right ovary containing a corpus luteum. It is very easy here to demonstrate what we anticipated—the presence of rather marked varicose veins in the broad ligaments and running along beneath the tubes in the ovarian ligaments and around laterally in each infundibulo-pelvic ligament beyond the ovarian attachment. Small varicosities are also seen running down the broad ligaments close to the uterine wall on either side.

Inspection of the ligaments with respect to their development or relaxation should now be made. We see that both the uterosacral and round ligaments are loose and free, decidedly relaxed, but are well developed. The round ligaments are, however, definitely thinner at their uterine attachment and thicker as they enter the inguinal rings. Sometimes the round ligament is markedly attenuated throughout its entire length, or one is poorer than the other, or it may be the inguinal ring end which is thinner. Not so infrequently the uterosacrals are so thinned out that they can be discovered only by making traction on the cervix. Adhesions or localized inflammatory infiltration may also complicate the situation. Again, the uterus may be enlarged, hard, and fibrotic, or enlarged, soft, and boggy, subinvoluted, or small and atrophic. It must also be carefully examined, to discover, if such exist, any small interstitial growths. A careful consideration of all these conditions should determine the type of procedure to be followed. Inasmuch as the ligamentary attachments of the uterus do not comprise all the factors which maintain it in its normal anatomic relations, we must constantly bear in mind that in shortening the round ligaments we are not effecting an anatomic cure so much as merely doing the best we can in a mechanical way with such material as we have to work with. Hence one method may be best adapted to one case, another to another.

The fundus of the uterus in the grasp of the volsellum is now held by the assistant well toward the pubes, traction being forward and not upward, for in some cases the organ might be lifted well out through the abdominal incision. A long forceps is now pushed against the broad ligament on the left side close to the uterus immediately beneath the utero-ovarian ligament. It is not pushed through the broad ligaments at this point, but enough pressure is made against the ligament so that the tip of the forceps can be seen bulging on the anterior side. At this point the broad ligament peritoneum is snipped through with the scissors so that the forceps can pass readily. This avoids possible laceration of the broad ligaments and too large a hole. The forceps emerge just above the round ligament and as close to the uterus as possible, care being taken in introducing it to avoid lacerating or cutting one of these enlarged veins. The left round ligament is now grasped about 1½ inches from the uterus and pulled through in such a way as to lie doubled on the posterior surface of the uterus. With my tissue forceps I test each side of the loop thus made to see that tension is equal, shifting my grasp on the ligament accordingly. This is important. The uterine peritoneum directly beneath it is now scarified by the knife and the ligament is attached to it by linen carried on a small full-curved needle, the smooth peritoneal surface of the flat ligament remaining superficial. As a rule, three stitches with the linen are sufficient to accomplish this fixation, and they are introduced through the under edges of the looped ligament in such a way that the linen is concealed and but one knot necessary. Care is also taken that this be done at a level neither too low nor too high. If the ligament is attached too low the uterus may fall over it; if too high, the uterus may slip down beneath it. I now take a long, light weight, iodin catgut on a full curved, non-cutting needle, and, beginning at the point where the round ligament has been pulled through the broad ligament,

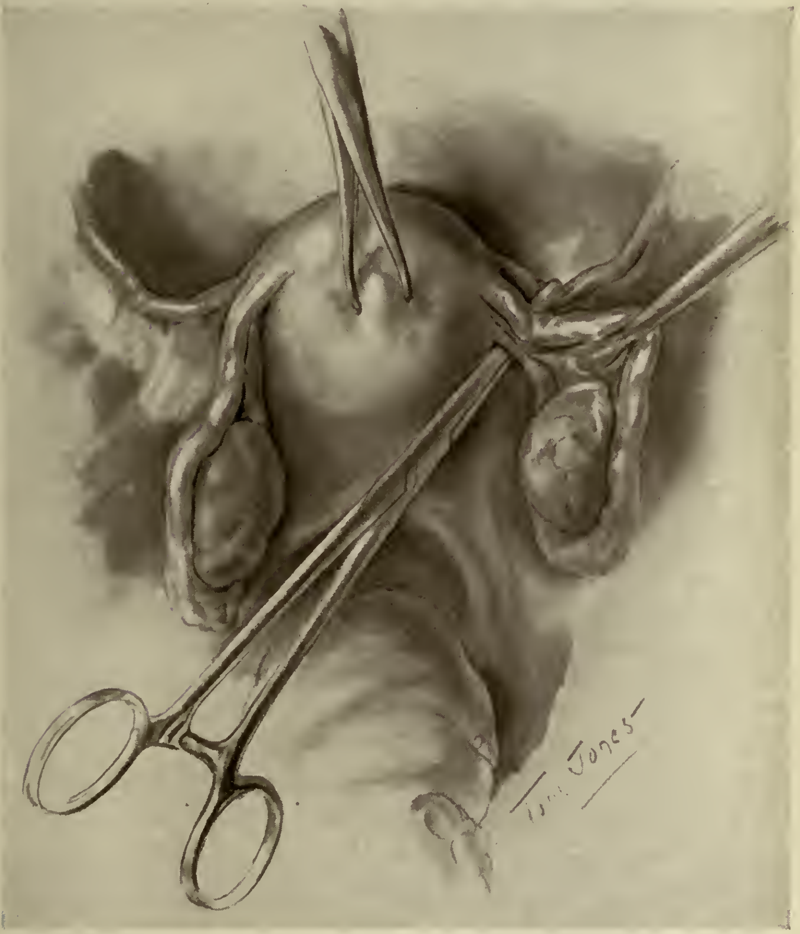

Fig. 66.—Clamp passed through the broad ligament beneath ovarian ligament. Round ligament grasped and ready to be drawn through.

I stitch the round ligament to the uterine wall, thus burying the linen and at the same time spreading out the round ligament over as extensive an area as it can be stretched. As I proceed

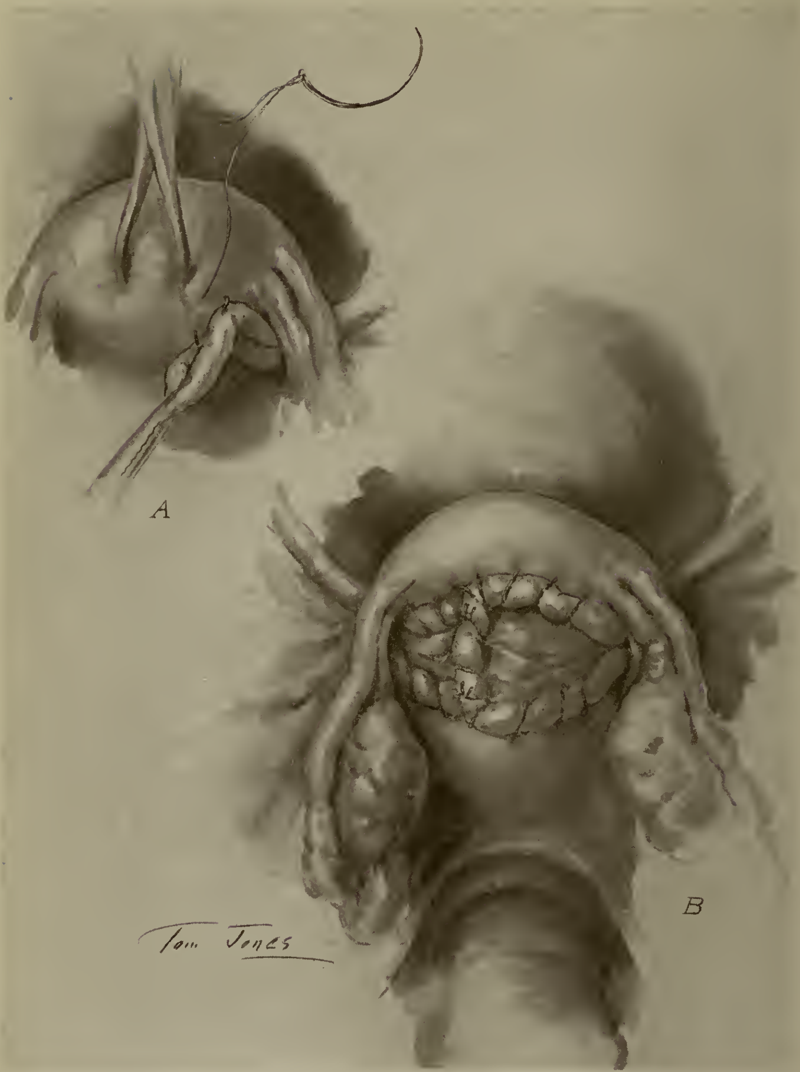

Fig. 67 —*A*, Round ligament folded upon itself, drawn through broad ligament, and a linen suture being inserted for fixation of ligament to posterior surface of fundus of uterus; *B*, after fixation of the ligaments the free edges are stitched with catgut, fanning out the ligaments and overlapping the first over the second. Note way in which the ovaries are suspended by this procedure.

along the upper surface it will be necessary to remove the volsellum, so that the ligament will cover the hole in the posterior

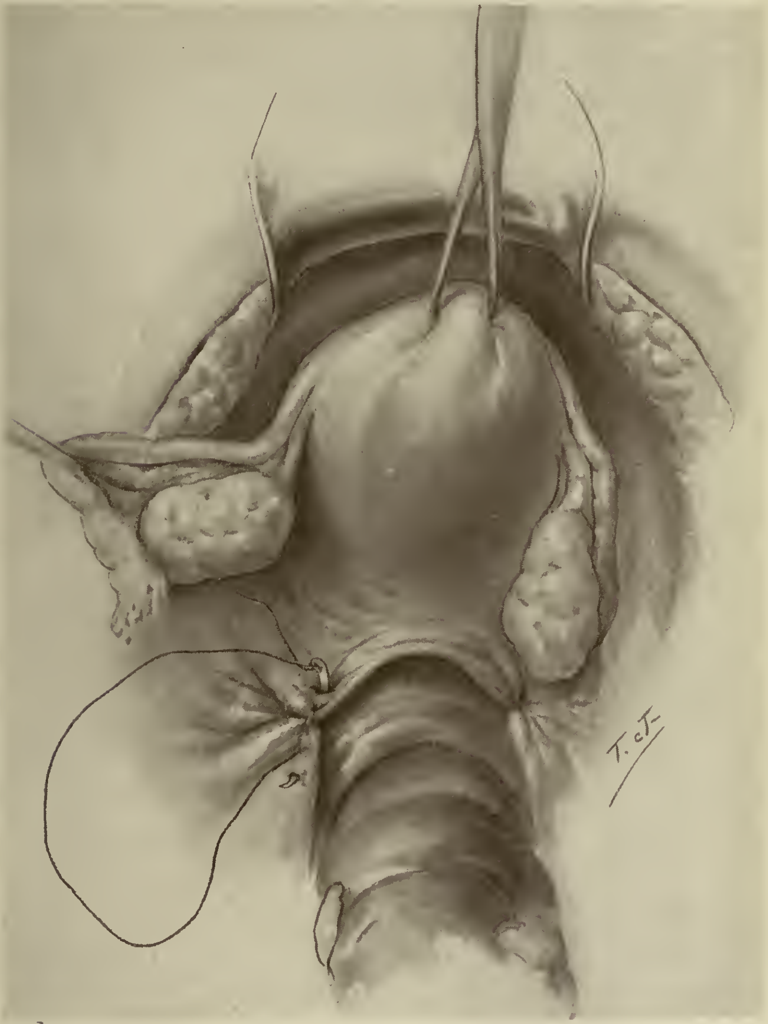

Fig. 68.—Plication of the uterosacral ligament.

uterine wall made by the volsellum. This same stitch may also attach the round ligament to the edge of the perforation in the broad ligament if this point is in evidence. This fanning out of the attached ligament, in the opinion of Webster, is one of the most important features of this operation.

The right round ligament is now pulled through the broad ligament as was the left, and attached to the posterior uterine wall from the right side in an exactly similar manner. We now have the uterine body swinging between the round ligaments which are shortened by their partial attachment to the back of the uterus. In some cases the relaxation of the ligaments permit only that they meet on the posterior uterine wall. In other cases, such as this, where the relaxation is greater, they will overlap. If the tube or tube and ovary of one side are removed, the broad ligaments then may be divided vertically, and the round ligaments doubled back over it and then stitched to the posterior surface of the uterus as described, the perforation of the broad ligament then not being necessary.

Another important feature of this operation is now nicely demonstrable. It is seen that the tubes remain straight and free and are not kinked or drawn down toward the points of puncture in the broad ligaments. It would not do, of course, to have the tubes kinked, and if the forceps are passed through the broad ligaments properly this will not occur.

Objection to this operation has also been made on the basis that in pulling the round ligaments through the broad they may be stripped of peritoneal covering. I cannot see how that could happen and have never met with such a result in my own experience, nor have I seen it happen in the work of my associates who follow the same procedure.

A second readily demonstrable advantage of this operation lies in the resultant suspension of the appendages. You can plainly see how well the tubes and ovaries are held up. Not infrequently in these cases of retrodisplacement the ovarian ligaments are stretched, and this makes necessary some additional suspension of the ovary. Following this method of ligament shortening that never becomes necessary.

The next step in our operation consists in shortening the uterosacral ligaments. I do not consider that shortening of the round ligaments alone is the proper procedure to overcome retrodisplacement of the uterus. In every case where the round ligament is included the uterosacral ligaments should be shortened as well. This is a point which has been too little emphasized. Shortening of the round ligaments alone merely brings the uterus into anteposition, whereas it requires shortening of the uterosacral ligaments in order to swing the cervix back and bring about the position of anteversion.

The technic of uterosacral shortening is simple, though it is not easy to demonstrate, inasmuch as these ligaments are more deeply situated in the pelvis. With a long light retractor holding the ovary and tube away, the uterosacral ligament is grasped with a long clamp approximately at its midline, and with a long linen thread on a non-cutting, full curved needle the ligament is shortened by simple plication from the center toward either end. As a rule, three stitches suffice. The clamp is removed as soon as the ligament is picked up by the linen, but the ultimate degree of shortening that is desired is not accomplished by the linen alone. After the linen is tied it is used as a tractor, and further shortening is accomplished with light weight iodin catgut, so placed as to plicate further the ligament and at the same time to bury the linen just introduced. The last catgut stitch goes into the cervical wall just anterior to the point where the uterosacral ligament attaches, and the linen tractor thread is cut away just before the catgut is tied. The left uterosacral ligament having been so treated, the right will now be done in precisely the same manner.

To revert by way of discussion to the question of round ligament shortening, the method here employed has been used in this clinic for approximately eighteen years, and is essentially that devised and performed by J. Clarence Webster. Its use should be limited to a uterus that is relatively normal in size and free from pathology, and to the years of child-bearing activity. It is not to be recommended where the outer portions of the round ligaments are noticeably thin, or where the uterus is unusually heavy, as in marked subinvolution, extreme fibrosis, or chronic endometritis. Neither should it be employed in a uterus that contains fibroids or other neoplastic growths. Its use, in other words, should be limited to cases where subsequent pregnancies are to be anticipated and where the tissues involved indicate its feasibility. The patient is advised that pregnancy should not take place for ten or twelve months following, and in some instances, especially where perineorrhaphy has not preceded the operation, it is well for the patient to wear a pessary for two or three months following operation.

The question has been asked as to subsequent pregnancy. Pregnancy following this operation any time after one year progresses in an entirely normal way and labor is no different on its account. There may be an occasional relapse after pregnancy, as has been reported even in the absence of pregnancy. I myself have seen no such recurrence where I have had the conduct of the pregnancy, labor, and puerperium. My best record is that of the case of a patient operated upon twelve years ago at the age of thirty-eight. She had been married sixteen years, with a spontaneous abortion the first year after marriage, her only pregnancy. Five months after I performed this type of uterine ligament shortening she aborted, again spontaneously. However, by the time she was forty-five years of age she had passed through three full-term labors, all spontaneous. She is now passing through her menopause, with the uterus in very good position.

This completes the work in the pelvis. Inspection of the abdomen shows that the gall-bladder is normal, the stomach and colon are in relatively good position and free from adhesions, the omentum is free, the kidneys are normal in size, each possessing about 3 inches of mobility, and the appendix is 3½ inches long and free, somewhat thickened, and slightly injected.

The question of appendicectomy in connection with other abdominopelvic work in women I will not discuss in detail. Suffice it to say that I remove the appendix, even if normal, as a routine where there is no contraindication to extending the operative work that much further.

The appendix is first freed from its bed of adhesions, if such exists; its tip is then grasped by a clamp and raised in this manner.

I then pass an iodized catgut ligature through the meso-appendix close to the base of the appendix. This ligature is tied and its ends placed in the grasp of a hemostat. With the scissors the appendix is now freed from its mesentery well down to its base. These two short clamps are now fixed in place, the first one clamping the appendix quite at its junction with the cecum, the second, $\frac{1}{4}$ inch higher. With the electric cautery blade I now amputate the appendix, burning away all tissue above the lower clamp. A continuous Pagenstecher linen suture on a small curved intestinal needle is next started between the meso-appendix ligature and the clamp, the clamp is then removed carefully, and the linen is continued, passing from side to side, just far enough away from the base of the wound in the cecum, so that, as the linen is drawn taut, the edges of the wound are inverted and buried. As soon as this is accomplished throughout, the direction of the suture is reversed and a second over-and-over row of stitches is introduced, exactly superimposing the first and terminating at the point of origin, where the linen is tied. Care is taken to keep the cauterized wound from gaping during this sewing by holding it tightly at its distal end with a toothed tissue forceps. The operation is now completed by a simple Lembert peritonization suture of fine iodized catgut, commencing at the outer, distal end of the wound and continuing inward, until not only the linen is buried, but the meso-appendix ligature stump as well. I may say that this is the method I employ, also, in cases of acute appendicitis.

Before closing the abdominal wound the patient is lowered into the horizontal position. The peritoneum is grasped by a volsellum at the upper angle of the wound and by long clamps at the lower angle and midway on each edge. By lifting up with these four instruments the assistant is able to bring the peritoneum well above the intestines and omentum, at the same time holding its edges together. The last stage of peritonization is now carried out by sewing opposing peritoneal surfaces together, thus everting the cut edges into the abdominal wound. A continuous iodized catgut suture is used for this purpose.

The next step in closure consists in placing the retention sutures. These are four in number and are made up of heavy braided silk filled with a turpentine solution of guttapercha. This makes a very strong but soft and pliable material for through-and-through suturing. Each is threaded on two heavy curved cutting needles which are passed from within outward, through rectus, fascia, and skin, omitting the subcutaneous fat, one on each side. These sutures are placed about 1 inch apart and are not tied at this time.

The fascia is sewn together by over-and-over, interrupted, iodized catgut sutures. I still feel that this is safer than a continuous suture. It is evident that I am closing the abdominal wound very much the same as I would had there been present a ventral hernia. That is just the point. In every case where diastasis of the abdominal recti exists or even where there has been extensive or long-continued distention of the abdomen, as obtains in pregnancy, potential ventral herniation is present. All the more important then is it to take every precaution not only to ward off the danger of postoperative hernia, but to do all that can be done to strengthen the relaxed flaccid abdominal wall.

The fascial edges have now been united and we pass on to the skin. For closing this we use a continuous, interlocked suture of black silk. The stitches are placed $\frac{1}{2}$ inch apart, so that skin drainage is permitted. No matter how dry a wound may be by the time for closure, there will always be some serum that should escape. Too tight closure of the skin prevents this. We now tie the four braided silk retention sutures, these also to be tied loosely rather than tightly. This completes the closure and the wound is now ready for the dressings.

CLINIC OF DR. EDWARD LYMAN CORNELL

PROVIDENT HOSPITAL

KRÖNIG CESAREAN SECTION

Summary: Present attitude of the profession toward the classical operation —indications and contraindications. The Krönig operation—its advantages—technic—occasional emergencies met with during and after the operation; average results.

I PRESENT for your consideration an operation having for its object the saving of two lives under adverse conditions. Such is the Krönig cesarean section. This operation was designed to prevent general peritonitis in neglected cases of contracted pelvis and to preserve the life of the fetus.

Previous to this, craniotomy was the operation attended with the least risk of infection. No one wishes to perform such a cruel operation on a living child.

It is interesting to note the change in attitude in regard to the cesarean section in the past twenty years. In 1900 comparatively few were performed. In 1919, on the other hand, "everybody is doing it." Are the general results more favorable now?

One hardly knows how to answer that question. We read of the splendid results obtained by Davis, Hirst, De Lee, Webster, and others of repute, but no one reads the results obtained by the average general surgeon or practitioner. There are many cases of maternal deaths following the classical operation which have never been reported. Gross neglect of indications, asepsis, ignorance, and failure to make examinations are responsible for most of the serious results. One case comes to my mind at the present time: A primipara, Catholic, came under the care of a general physician of good repute. His practice is large and he has the average run of obstetric cases. He is so busy with general work that he handles his pregnancy cases in the usual "how-do-you-do—good-bye" manner. No measurements were taken, no examinations made except the urine. The patient went into labor and remained at home. After twenty-four hours no progress had been made, so the patient was examined vaginally without preparations of any kind, even without gloves. It was stated that the physician then had her shaved and forceps were applied through a cervix not fully dilated. After several futile attempts the forceps were removed and the patient allowed to wake up and labor twelve hours longer. They were then applied unsuccessfully. After this a young consultant was brought into the case. He advised removal to a hospital and craniotomy, as the pelvic inlet was too small. Owing to the patient's religion, craniotomy on the living child was not allowed. A classical cesarean section was performed and a live child delivered. The mother died in five days from general peritonitis. This case does not appear in the literature. This same consultant has lost two other mothers to my personal knowledge. Yet none of his unfavorable results are reported.

Some one asks, What would I, as consultant, have done under similar circumstances? Taking it for granted that the pelvic contraction was such that a live child could not pass, there were two courses open: One was to insist on doing craniotomy. This offers the best chance for the mother. The other was to perform the Krönig operation, which I am going to describe.

It is easy to perform a classical cesarean section. Anyone handy with the knife can do it, but, and this is important, it takes one with obstetric knowledge to tell when not to do the classical operation. This knowledge is only obtained after a large obstetric practice. Judgment should be combined with knowledge and obstetric skill.

I was called the other evening to see a case of lateral placenta prævia in a woman who is a missionary in an out-of-the-way country. She had a normal-sized pelvis and a moderate-sized child. The surgeon who was handling her case favored doing a cesarean section. I advised against it in face of the fact that the patient had already lost considerable blood. The main reason for this decision, aside from the obstetric, was the fact that the patient was to return to her mission where medical attention was not the best. A cesarean scar is liable to rupture, and if she had a second pregnancy in the foreign country with a ruptured uterus she might die. The patient finally delivered a live child following the use of a Voorhees bag.

I have operated or assisted in over 80 classical cesarean sections. In none did the mother die; several fetal deaths occurred either from status lymphaticus, prematurity, or brain hemorrhage. In not over 3 cases did the mother have a suggestion of infection; one was a tuberculous case. Why such good results? Absence of meddlesome midwifery and a knowledge of when not to do the classical cesarean section answers the question.

The classical cesarean section is contraindicated in women who have been subjected to repeated vaginal examinations under septic conditions or who have had intra-uterine manipulations. In every branch of surgery the operator works in an exposed field, one that is seen, while the obstetrician works in a field that is hidden from sight. Most surgeons and general practitioners fail to appreciate this fact.

This field is a particularly good one for the growth of bacteria. We have body heat, fertile pabulum for food, plenty of fluid, more or less bruised tissue, and bacteria. It is fortunate for us that the bacteria normally present in the vagina are harmless to the host under ordinary conditions. It is the bacteria introduced by the operator and sexual intercourse that play the mischief. The bacteria found in the vagina if carried into the uterus may, and frequently do, cause puerperal sepsis. In a long-drawn-out labor one frequently notes an elevation of temperature, especially in those cases in which the bag of waters has been ruptured some time. The vaginal discharge frequently becomes purulent. This is so even where all examinations have been made per rectum. It is dangerous to perform a cesarean section under these conditions.

No one would deliberately open an abdomen covered with pustules or after it had been smeared with staphylococci or colon bacilli. Yet the same surgeon does not hesitate to do a classical cesarean section after meddlesome midwifery.

The Krönig operation is useful in neglected cases and in selected cases which have not been mismanaged. At this hospital we have used it where examinations have been made, and in clean cases after the usual test of labor. In general, it should only be employed on patients who have been in labor a few hours. The lower uterine segment should be formed. Unless this occurs, the uterine incision cannot be made entirely below the body of the uterus.

If possible the patient is prepared for operation some days in advance. Attention is given to the bowels. No drastic catharsis is administered, as this tends to weaken the patient and to cause abdominal distention. A mild laxative like aromatic cascara is given. When the patient goes into labor or is in labor on entrance, the vulva and abdomen are shaved and a soapsuds enema is given. This removes the bulk of the fecal matter from the large bowel. Just before the operation the abdomen is prepared by the clean nurse, who washes it thoroughly with cotton pledgets soaked in green soap and water, followed by bichlorid 1 : 1000 and lysol ½ per cent.

The patient is catheterized just previous to operation and the catheter is allowed to remain *in situ*. After the patient is asleep she is placed in the Trendelenburg position.

This patient applied to the Stock Yards Branch of the Chicago Lying-in Hospital Dispensary for antenatal care. She was seen during the seventh month of pregnancy. She is thirty-five years of age, married for fifteen years, and pregnant for the first time. She has always been well with the exception of having had measles in 1917. She is one of four children and her husband is one of twenty-one. The father of the patient is living and well; mother died from an unknown cause. Her brothers and sisters are all dead.

The patient has felt well during pregnancy. At the first examination no abnormality was discovered, no tumors were palpated, and the prediction was made that she would have a normal delivery. Quickening occurred October 20, 1918.

On the afternoon of April 8, 1919 patient felt some abdominal discomfort, but did not recognize it as a labor-pain until midnight. The intern of the out-patient department was called at 2 A. M. April 9th. The pains were occurring from two and a half to four minutes apart and were relatively weak. Rectal examination at 3 and 6 A. M. showed the head deep, narrow, and movable; the cervix was not felt. The intern noted that the examination was unsatisfactory. Abdominally, the head was down to the inlet, the occiput to the left and in front. The heart tones were heard near the umbilicus on the left side, the rate being 140 and regular. Measurements externally showed the pelvis to be slightly contracted in all diameters: interspinal, 24½ cm.; intercristal, 26 cm.; bitrochanteric, 32 cm.; Baudelocque's, 19 cm. On the anterior surface of the uterus near the fundus was a small fibroid about the size of an almond.

Rectal examination at 9.30 and 11 A. M. showed a large soft mass in the pelvis simulating a bag of waters, but no cervix could be felt. Because of the uncertainty of the rectal examination the intern made a vaginal examination at 11.10 A. M. This showed the cervix to be located very high in the pelvis and well behind the superior margin of the symphysis. It was partly effaced and dilated to 2 cm. The bag of waters was intact. Posterior to the cervix a soft mass was felt behind the posterior portion of the lower uterine segment and in front of the head. It did not seem at that time that the mass would prevent engagement of the head, and an effort was made to reduce it by placing the patient in the knee-chest position for about forty-five minutes. Subsequent rectal examination showed the mass to be larger and deeper in the pelvis. The cervix could not at any time be felt per rectum.

I was asked to see the patient at 5.30 P. M. Vaginal examination at that time showed the cervix to be in the same position behind the symphysis, 4 cm. long, with 2 cm. dilatation. The head was floating and the posterior half of the pelvis was filled with a soft mass which prevented engagement of the head. The bag of waters was still intact, the mother in good condition, and the baby's heart tones 150 per minute.

The patient was removed to Provident Hospital and a cesarean section was decided upon.

The diagnosis in this case is prolapsed ovarian cyst, probably twisted (Fig. 69). This diagnosis is made from the following facts: The mass is soft and fluctuating; it has gradually increased in size and become more tender.

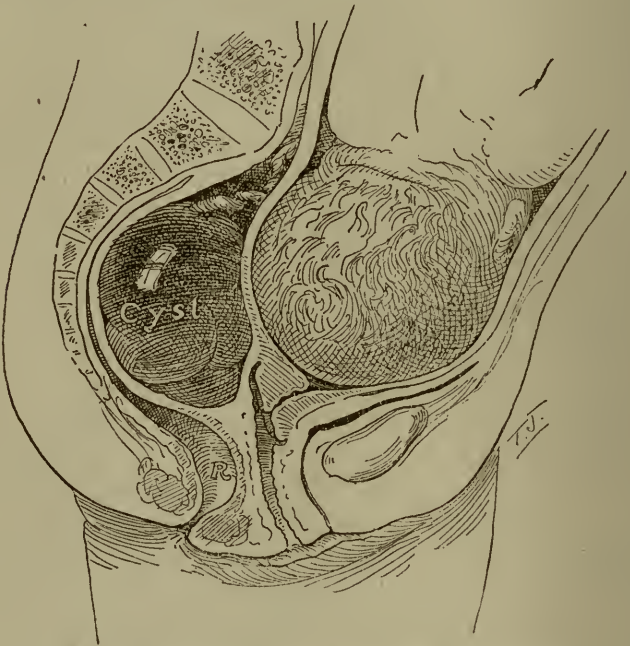

Fig. 69.—Dystocia due to a prolapsed ovarian cyst.

The incision is made from the umbilicus down to the symphysis pubis in the median line. The fascia is split about $\frac{1}{4}$ inch to the left of the linea alba and the rectus muscle is retracted to the left. The incision is then carried through the peritoneum. Care must be taken not to injure the peritoneum lying over the uterus. The abdominal walls are now retracted and the peritoneum over the lower uterine segment is grasped by tissue forceps about $\frac{1}{2}$ inch above the junction of the bladder with the uterus. A transverse incision is made here, about 10 cm. long, and the loose peritoneum is then dissected upward, using the finger (Fig. 70). This dissection is carried out in a semicircular fashion. Following this we dissect up the peritoneum below,

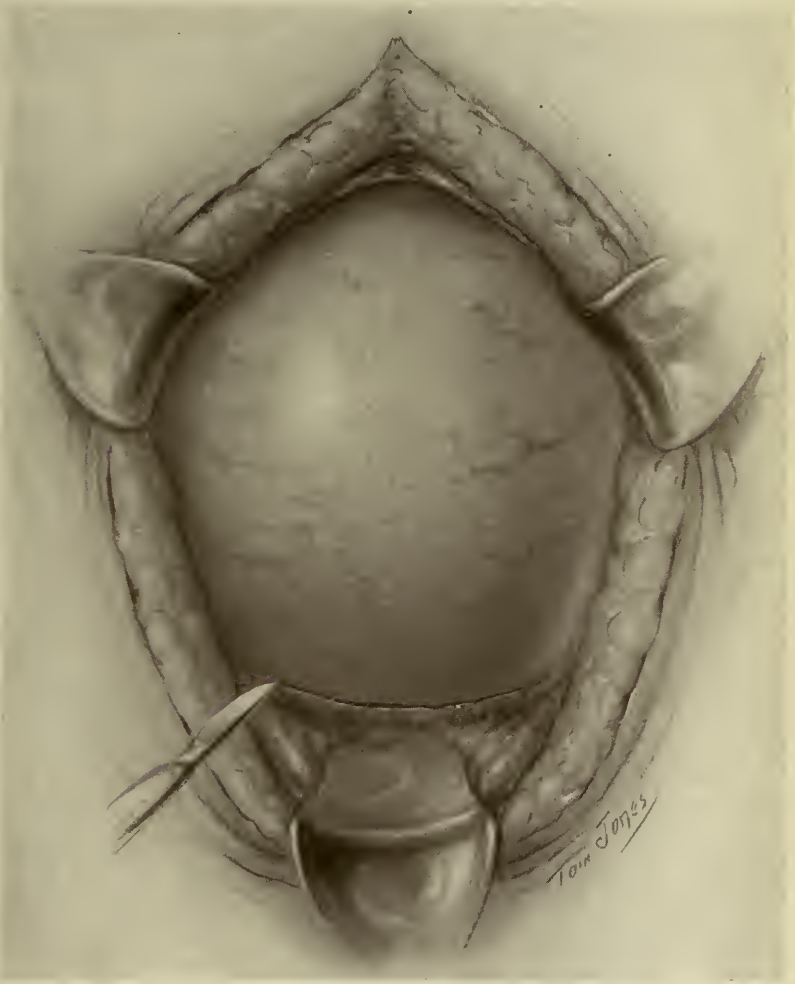

Fig. 70.—Transverse incision through peritoneum 1 to 2 cm. above the level of the bladder for exposure of the uterine wall.

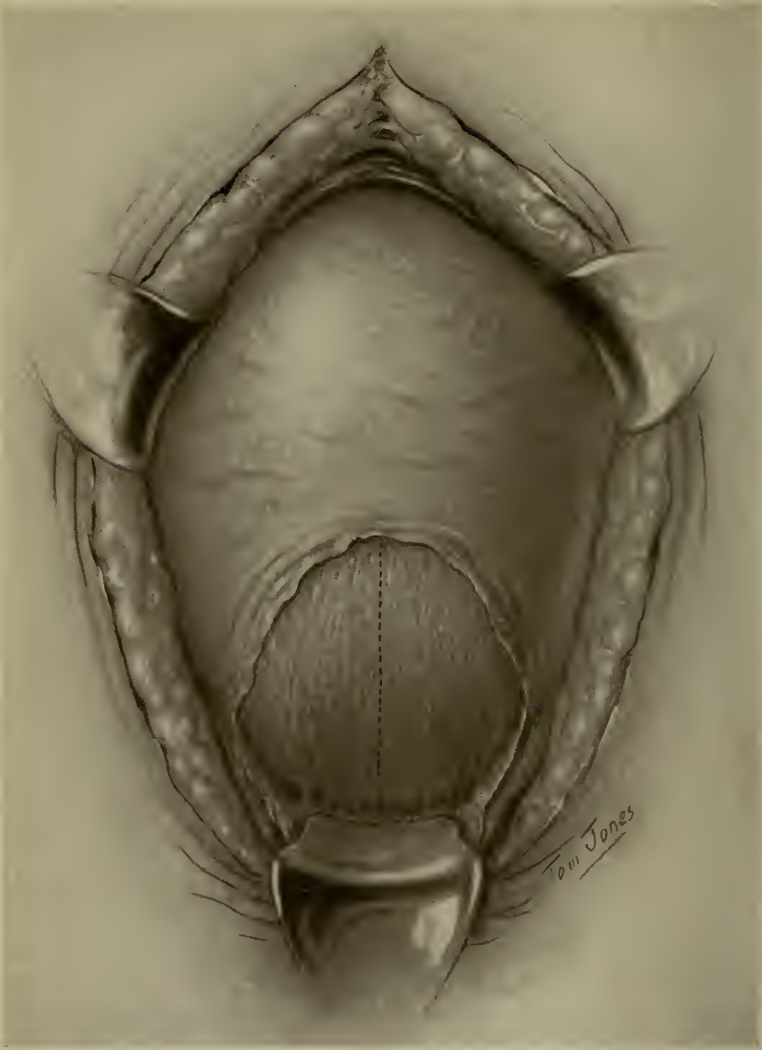

Fig. 71.—Peritoneum reflected. Dotted line indicates location of incision into uterus.

including the bladder, which is separated low down toward the vagina.

The bladder is retracted against the pubis. Care must be used by the assistant so that too much traction is not made, as the bladder may be injured by pressure between the retractor and the symphysis pubis.

This leaves a somewhat elliptic-shaped opening through the peritoneum and exposes the lower uterine segment.

The next incision is made parallel with the longitudinal axis and in the center of the uterus. The incision through the lower uterine segment is started from below in order to avoid covering the line of incision with blood. Care must be used in incising the uterus in order to avoid cutting the baby's head, which lies close beneath the cervix (Fig. 71).

If the line of incision is covered with blood, so that the view is obstructed, it is best to carry the incision through the segment up to its upper portion and then enlarge the opening downward by using blunt scissors, feeling the way with the fingers. This avoids any possible injury to the fetal head and also injury to the bladder or urethra. The incision in the uterus should be made from 10 to 12 cm. long.

After rupturing the membranes the finger is placed in the baby's mouth and the face rotated anteriorly. Forceps are applied quickly and the head is delivered by flexion, the rest of the baby following without any particular mechanism.

In delivering the head the principles of normal delivery are followed, using the upper end of the uterine incision as one would the symphysis pubis in a normal cephalic case. The child is now grasped by the feet, the mucus cleaned from the nose and throat, and the cord cut between two clamps. It is always best to have an assistant who is competent to use the tracheal catheter, as this relieves the operator and does not distract his attention from the mother.

After delivery the upper and lower ends of the uterine incision are grasped with volsellum or Allis' forceps and the uterus pulled gently up on a line with the abdominal wound. This prevents the blood from entering the abdominal cavity and also prevents contamination when the placenta and membranes are delivered. The assistant then injects 1 mil. of pituitrin directly into the uterine muscle in two different places. This usually causes a good uterine contraction in a very few minutes. There is no hurry in removing the placenta. When it is located in a portion of the uterus away from the incision it is surprising how readily it separates. It is frequently expelled spontaneously through the uterine incision. In case this does not occur, it is gently shelled out of the uterus. Great care is used in dealing with the membranes. These should all be removed in order to avoid saprophytic infection.

Many times it is possible to expel the placenta by making pressure on the fundus through the abdominal wall, somewhat similar to the method used in early expression.

After the placenta is expelled the uterine cavity is examined and all clots are removed. The cervix is investigated, and if it is not dilated, dilatation is attempted from above until it admits two fingers. In removing the hand, care should be taken not to wipe the fingers over the cervical or abdominal wound.

The gloved hands are then washed in pure lysol or, in case of suspected vaginal discharge, another sterile pair of gloves is put on. The uterine wound is then sewed with two layers of No. 2 twenty-day chromic catgut, great care being employed to sew the extreme ends of the incision. The time spent on this work is not wasted, as seepage between the uterus and peritoneum can be prevented, thus rendering infection less likely. After the uterus is sewed the upper peritoneum is replaced and stitched. The bladder is brought up and fastened over the upper edge of the loosened peritoneum so that no portion of the uterine wound is exposed.

This completes the abdominal toilet unless it is essential to sterilize the patient. In a clean case it is permissible, as the risk from infection is not great. As this operation is done for prevention of infection, it is unwise for the operator to make any other abdominal examination, and especially to massage the uterus within the abdomen. This may spread infection throughout the abdomen and defeat the purpose of the section. If further examination is deemed advisable in spite of this precaution, it is best to change gloves and to protect the examining hand from coming in contact with instruments already used.

In the case at hand we have a complication to deal with. The gloves are changed and clean instruments are used. As the obstructing tumor lies behind the uterus, the latter is lifted up and forward. The cystic tumor is exposed; it is a twisted ovarian cyst on the left side. Notice the purple injection. The ovarian artery is ligatured and the ovarian pedicle caught in an 8-inch clamp; it is cut away and a running suture of No. 2 catgut is placed around the clamp. This controls bleeding and closes the peritoneum. The uterus is now replaced.

The abdominal wound is closed in the usual manner. At the Chicago Lying-in Hospital and here we are spending considerable more time in closing the abdominal wound than is customary at many other clinics. We find we have better results in subsequent pregnancies and less liability of hernia.[1]

The Krönig operation requires more skill than the classic cesarean section. Those who have tried it prefer it to the old operation, and we are coming to use it more and more frequently, as the after-effects are less severe.

Occasionally we meet with an emergency in this operation. I shall mention a few features that are unusual: In one case profuse hemorrhage was encountered due to marked varicose veins, and a hematoma formed in the lower uterine segment. It became necessary to ligate these veins about 3 cm. from the uterine wound and to release the blood in the hematoma.

In one or two cases it was necessary to carry the uterine incision upward, due to a large fetal head. This does not offer a great disadvantage, except that it leaves the upper end of the uterine incision exposed to the abdominal cavity. It may possibly be a factor in causing malunion of the uterine incision, as the miscellaneous layers in the lower uterine segment are different from those in the body of the uterus. This may cause a see-saw action during uterine contraction at the junction of the cervix and the body of the uterus; unless coaptation is accurate and suturing secure this may lead to separation of the wound, at least in a portion of its depth. In case of seepage, general peritonitis is liable to follow.

---

[1] This patient made a splendid recovery. The highest temperature was 100° F. on the second day. She was out of bed on the eleventh day and discharged on the thirteenth. Her baby regained its birth weight on the tenth day. Six weeks later she reported, and the uterus was freely movable and in good position. The abdominal wound was in excellent condition.

In another case on opening the abdomen I found the bladder filled with urine. This patient had been catheterized thirty minutes before the operation. She was extremely nervous, and aside from the inconvenience of recatheterization no harm was done. In personal operations or those in which I have assisted, this is the first instance of the bladder being full at the time of operation. Since this the catheter is left *in situ.*

I shall cite briefly a few cases operated by this method, giving you only such history as is of interest.

CASE 608.—The patient, aged twenty-five, para 2, was delivered two years previously with high forceps, which resulted in a stillbirth. The baby weighed 7½ pounds. Her two sisters had had cesarean sections. The pelvic measurements were 25.5—28.5—31—20, with a diagonal conjugate of 9. She went into labor and the test was given. At the end of twelve hours it was found that the head was still high, the lower uterine segment well developed. She was having good strong pains, but no progress was made. The low cesarean section was performed. The patient developed a temperature of 100° F. shortly after the operation and a rapid pulse.

The temperature remained approximately the same for ten days, the pulse running from 100 to 130, yet she complained of no pain. The abdominal wound was observed several times, but no redness appeared. On the tenth day she complained of pain at the lower edge of the wound. The stitches were removed and pus exuded from the lower three. The wound was exposed rather widely and 2 ounces of pus flowed from the lower portion.

Upon questioning the patient I found that the night previous to entrance to hospital she had had sexual intercourse. This undoubtedly accounts for the infection, as no internal examinations had been made. It was noted that the vaginal discharge on the tenth day was purulent in character. After draining the abdominal wound the temperature and pulse gradually came down and the patient was discharged in five weeks after operating. It was interesting to note that she suffered comparatively little, the toxemia was not severe, and the infection was confined entirely to the lower portion of the wound. Postpartum examination twelve weeks later showed the uterus to be freely movable and no tenderness.

Case 787.—The patient, aged thirty-seven, para 2, was delivered of a 6½-pound child seven and a half years previous by difficult high forceps after being in labor three days.

The pelvic measurements were 25—26.5—31—18. The patient had been in labor all night under the care of another physician; three vaginal examinations had been made, one outside and two in the hospital. The head was not engaged. The cervix was effaced and dilated 6 cm. The estimated weight of the baby was 7¼ pounds. Low cesarean section was performed, and the patient left the hospital thirteen days after delivery, stating that she felt comfortable.

No vaginal examination was made by me, but per rectum the promontory was easily felt. Examination fourteen weeks later showed the uterus to be in good position and the scar about ¾ inch long.

Case 730.—The patient, aged twenty-nine, para 1, with pelvic measurements of 25—27—31—21, went into labor on November 16th, R. O. P.; head above inlet. She was in labor twenty-four hours and the cervix did not dilate well, nor did the head engage.

The vaginal tract was leather-like in character. The patient was given ¼ gr. of morphin at the end of twenty-four hours to obtain rest. Six hours after she awakened the cervix still remained small. The bag of waters was ruptured artificially. The patient was allowed to labor for another six hours and the cervix was found to be dilated 6 cm. An attempt was then made to rotate the head anteriorly by means of the bimanual method. The head was rotated to the transverse, where it was held during several pains. The patient then labored for about four hours, at the end of which time the cervix was dilated to 9 cm. and the head rotated posteriorly again.

Internal rotation was then attempted by pushing the head upward and drawing the anterior shoulder to the left side. The occiput was placed in the anterior position and kept there through several pains, light ether anesthesia being used.

The fetal heart tones were quite rapid at this time, ranging from 160 to 180. The patient's pulse was running over 100 and she commenced to show signs of exhaustion. The vaginal tract was very firm and admitted the hand with considerable difficulty. She was allowed to labor for another three hours, at which time the fetal heart tones were running from 180 to 200. Upon examination it was found that the occiput had rotated posteriorly again.

It was a question whether to attempt to mutilate the patient by a difficult high forceps operation through an incompletely dilated cervix and a vaginal tract which was resistant, or to remove the baby by the Krönig cesarean section.

I had three weeks previously gone through a somewhat similar experience in which the cervix and vaginal tract had been badly lacerated by a version and extraction in an occiput posterior. I decided upon the Krönig cesarean section. Delivery was easily accomplished in this manner, the operation being done on November 18th at 2.45 P. M. The patient was discharged from the hospital on the 30th. The highest temperature was 100.4° F. and pulse 128, which was on the first day. She felt very well throughout her stay in the hospital.

Upon examination on January 22d the uterus was found to be in excellent condition, freely movable, and the line of incision in the cervix could be felt and was approximately $\frac{3}{4}$ inch long.

While it is true that interference in this case was done under the strictest asepsis possible to obtain, I feel that we prevented this woman from becoming a chronic invalid by this method of delivery. One certainly could not have risked a classical cesarean section in a case of this character.

I will not burden you further with reports of other patients.

I will conclude by stating that I feel the Krönig operation has a distinct place in obstetric practice. It is useful in neglected cases where one feels that puerperal sepsis or peritonitis is apt to follow the classic cesarean section. On the other hand, I wish to sound a note of warning that this operation will not prevent puerperal sepsis in cases already infected through meddlesome midwifery.

The mortality results, so far as mothers are concerned, have been nil. The morbidity is not as high as cases treated by high forceps, craniotomy, etc. We have lost no more babies than by other methods. The uterus does not become adherent to the abdominal wall. The scar is so placed that rupture is less liable in subsequent pregnancies.

CONTRIBUTION BY DR. ROY L. MOODIE

DEPARTMENT OF ANATOMY, UNIVERSITY OF ILLINOIS, COLLEGE OF MEDICINE

STUDIES IN PALEOPATHOLOGY: THE DISEASES OF THE ANCIENT PERUVIANS, AND SOME ACCOUNT OF THEIR SURGICAL PRACTICES

Summary: Brief account of the position of the ancient Peruvians among the early peoples of the Western Hemisphere, the conditions under which they lived, their antiquity, their development, and sources of knowledge of the nations which composed this ancient civilization. Abundant evidences of disease in ancient times derived from the study of skeletons, objects of art and architecture, methods of embalming and preservation of the dead—relation to the life of the people. Discussion of the evidences of the occurrence of goundou, uta, verruga, osteo-arthritis, syphilis, osteoporosis, and other bone diseases. Surgical practices of trephining, amputation of limbs, lips, and nose. Instruments used by the primitive surgeons. Artificial deformations of head, fractures, and types of skull injuries.

THE paleopathology of South America is largely confined to the Peruvian region,[1] and chiefly to that occupied by the Peruvian Indians under the Incas. This area embraced at times wide portions of what are now the modern states of Chili, Bolivia, Peru, Brazil, and Ecuador, since at various times in the history of the Inca princes they sent conquering expeditions into these regions, on which they left more or less impress of their culture.

Of the peoples of the northwestern coast of South America, once ruled by a more or less mythical prince known as the Grand Chimu, and subsequently subdued by the Incas several decades prior to the coming of the Spaniards, little or nothing is known, save what we may learn from the ruins of their edifices, and the ornaments, textiles, potteries (huacos), and other objects taken from their tombs (chulpas). Nothing of the physical anthropology or paleopathology of this race is known.

---

[1] All that is known outside of this area is the pathologic condition in the skull fragment of a primitive man, described by Ameghino as *Diprothomo platensis*, which shows a perforating skull injury, due possibly to an arrow-point, which had been slightly septic, but had been well healed.

The more ancient inhabitants of the Peruvian territory, the megalithic predecessors to the Incas, centered around Lake Titicaca. Later the Inca prince, Manco Capac, led the people northward to the place where his magic golden wand disappeared into the earth, and where he established the City of the Sun, the golden city of Cuzco, which still survives under the original name, but is modernized by being the terminal of the Peruvian Railroad. Here, surrounded by high, rugged mountains and deep gorges, they developed one of the most advanced American civilizations, which was only approached in perfection by the ancient Mayas of Yucatan before the subsidence of the earth, through geologic changes, resulted in unfitting their territory for human habitation.

On account of the well-organized social system of the Incas, their agricultural and mechanic arts, military knowledge, and architecture, their civilization has appealed to the imagination of students of history, sociology, and anthropology for many decades, centuries in fact. Since the discovery and first exploration of Peru by the Pizarros and their companions from 1532–1540,[1] there have been many interesting and important contributions to our knowledge[2] of the anthropology, archeology, and linguistics of the three or four larger "races" or groups of Indians who in ancient times inhabited the Peruvian territory from the sea up to the highest mountain peaks, which at present reach an elevation of more than 18,000 feet.[1] These groups of peoples, variously known as the Aymara and the Quechua, in the central and southern highlands; the Huancas, in the north; and the Yungas or Chinchas, along the coast, besides a considerable number of unclassified tribes in the northeastern and northern regions of the Peruvian territory, all spoke a number of different languages, and differed from each other in many respects. Markham[2] finds a strong similarity running through the various languages, and attributes them all to a common stem language, the Quichua or Runa-simi, of which there is a dictionary by Torres Rubio, which has been revised by Sir Markham.

---

[1] The best modern account of this Spanish expedition is that of Wm. H· Prescott, Conquest of Peru. He based his account on the writings of the Spaniards, to whom he gives abundant references.

[2] Chief among these is the work of E. George Squier, Peru, Incidents of Travel and Exploration in the Land of the Incas, London, 1877. This work was the result of several months' personal exploration of the ancient civilizations of Peru. A very charming work is that of Sir Clements Markham, The Incas of Peru, London, 1912. Garcilasso de la Vega, a descendant of the Inca princes through the marriage of his Spanish father to an Inca princess, has left very valuable records of the life of these people who have now almost entirely disappeared.

So little is known of the physical anthropology of these ancient peoples that no definite classification of them has yet been made.[3] The temples and huge walls built by the megalithic predecessors of the Inca race, as well as the structures reared under the direction of the Incas, have appealed strongly to the early explorers, many of whom spent huge sums in investigating the monuments in search of treasures of gold and silver. They destroyed much more than they recovered, although occasionally large amounts of precious metals were obtained. Squier tells very clearly how objects of interest to scientific men were ruthlessly destroyed. Skeletons and mummies were thrown to one side as so much soil, and thus was lost through hundreds of years precious evidences bearing on the anthropology and paleopathology of these races. The same statement holds true, however, for even scientific explorers in the Orient, where the chief interests were archeologic and human remains have been largely disregarded. Well-organized exploring expeditions to Peru, of a scientific nature, such as those from the Smithsonian Institution and the Yale University and National Geographic Society Peruvian Expedition headed by Professor Hiram Bingham have been well described[1] and will be referred to later in this paper. The enormous size of the buildings, the huge blocks of stone, beautifully fitted, of which they are composed, as well as the enormous distances they must have been transported, without vehicles of any kind, have aroused the amazement and wonder of students of the subject and have so far largely overpowered other interests.

---

[1] Sir Clements Markham, Incas of Peru, London, 1912, p. 38, adduces evidence to show that there has been considerable elevation of the region since its occupation by the Spaniards, and was hence much lower at the time of the Incas. This would, if true, explain the possibility of raising maize around Lake Titicaca and Cuzco in ancient times in sufficient quantity to support a large population. There is little geologic evidence to support such an extensive uplift as Sir Markham suggests, and if the region has risen at all it is only to be measured in feet. The conclusions of Darwin, quoted by Markham, are rendered doubtful by more recent evidence. It should be noted, however, that Dr. Edward W. Berry, on paleobotanic evidence, has postulated a rise of two and a half miles in the Bolivian plateau since Pliocene times. Whether this uplift is at present continuous is not known, and we cannot be sure what part of it has taken place in the past four hundred years.

[2] Incas of Peru, London, 1912, Chap. X, Language and Literature of the Incas.

[3] Ales Hrdlicka, Some Results of Recent Anthropological Explorations in Peru, Smithson. Misc. Collect., Wash., 1911, lvi, 2.

The antiquity of the ancient Peruvian race is not known, but the megalithic buildings, the probable authenticity of the long list of Inca kings,[2] and traditions carry some indication of an antiquity of three thousand years (from 1300 B. C.), although there is little definitely known of these ancient races prior to the thirteenth century A. D.[3]

There is sufficient evidence to prove the presence of a number of interesting diseases among these ancient peoples, who with the Nahua, the Maya, the Chibcha, the Toltecs, and the Aztecs, represented the highest development of American civilization prior to its destruction by the Spaniards in the sixteenth century. The study of these ancient races forms one of the most interesting phases of ancient history. Breasted[4] has called the attention of the Orientalists particularly to the methods pursued by the Americanists in elucidating the history of the early American people. But even the Americanists have not been making use of all available data, and until we know all that is to be known from all evidences we shall not know early American civilizations as they should be known.

---

[1] Hiram Bingham, In the Wonderland of Peru, Natl. Geog. Mag., Wash., xxiv, 1913, 387–573, 250 photos; The Story of Machu Picchu, Ibid., xxvii, 1915, 172–217, as well as the memoir of Eaton, which is referred to below.

[2] Sir Clements Markham, Incas of Peru, 1912, Chap. III.

[3] Clark Wissler, The American Indian, New York, 1917, 271.

[4] J. H. Breasted, The Place of the Near Orient in the Career of Man and the Task of the American Orientalist, Jour. Amer. Oriental Soc., xxxix, 161, 1919.

On the whole the life of the ancient Peruvians seems to have been a very healthy one, and relatively few diseases are known. Letulle has noticed, in an ancient Peruvian skull, probably pre-Columbian, a condition similar to goundou or gundu, a disease met with in West Africa (Fig. 72), and characterized by a swelling of the bone at the root of the nose. The disease is also known to occur in Malaysia.[1]

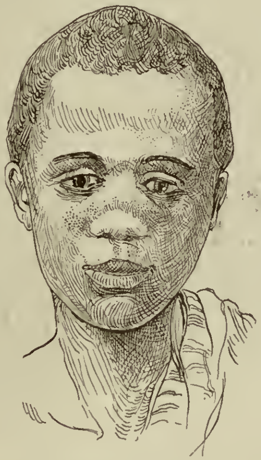

Fig. 72.—Face of a West Coast African negro showing, in the swelling at the root of the nose, the lesion of goundou, for comparison with the countenance depicted on the water jars (Figs. 73, *C* and 75, *D*). (After Castellani.)

The features depicted on an ancient Peruvian water-jar (Fig. 75, *C*, *I*) indicate the prevalence of gundu in pre-Columbian times and recall the usual form taken by the disease in Africa.[2] This water-jar, about 8 inches high, preserved in the American

[1] O. Schlagenhaufen, 1918, Schädel eines an Gundu erkrankten Melaniesiers, Mittheil. Geog. Ethnol. Ges., Zurich, with a good bibliography of the disease.

[2] A. Castellani, Manual of Tropical Medicine, 1913, 1445.

Museum of Natural History, must have been modeled by some early potter who was familiar with the lesions of goundou. The disease is not known to occur in Peru at the present day.

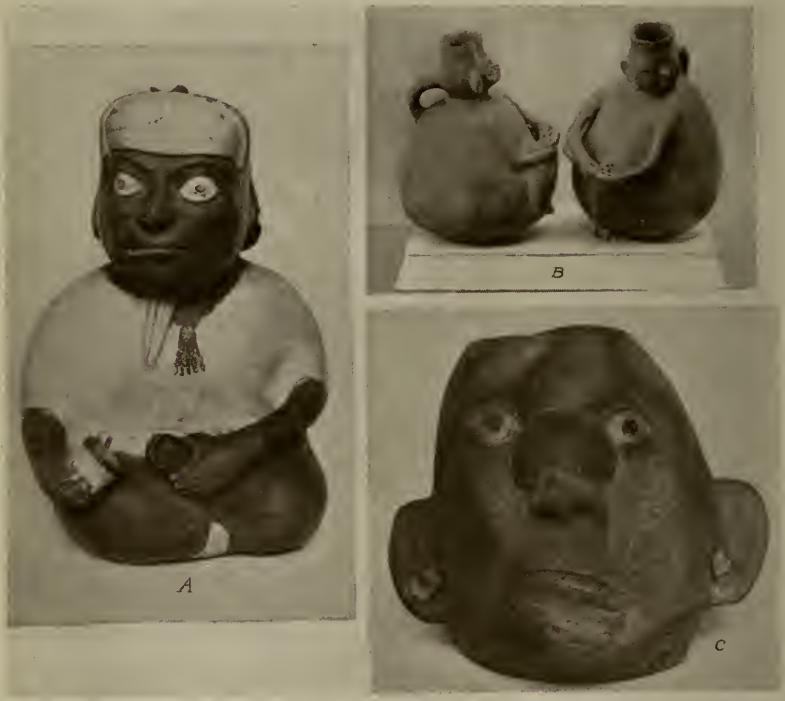

Fig. 73.—*A*, An example of ancient Peruvian pottery showing an amputated leg, at the tibiotarsal junction, with a cap of painted bone, wood or metal, in the right hand of the figure to adjust to the stump of the leg. Collected at Chimbote, Peru, by Bandelier. Original in American Museum of Natural History. *B*, These ancient Peruvian water jars show the seated figures examining the soles of their feet, in which there are holes left by the primitive surgeon after taking out the egg sacs of the sand flea "nigua." Original in American Museum of Natural History. *C*, An ancient Peruvian water-jar from Chimbote, Peru, collected by Bandelier, showing a swelling at the base of the nose characteristic of goundou of the present day, a disease prevalent in Africa and Malaysia. Original in the American Museum of Natural History.

Among the most loathsome of the present-day dermatologic lesions found in Peru is the disease known as *verruga peruviana.*

The history of this disease and its etiology are given by Strong,[1] from whose report it appears that it has afflicted the inhabitants from remote historic times. The disease first appears as a fever, with anemia and a nodular eruption upon the skin. Over four centuries ago, during the reign of the Inca, Huayna Capac, thousands of lives were swept away, supposedly by this disease. Zarate[2] in his history of the conquest of Peru says that verruga was more destructive than smallpox. De la Vega, a Peruvian writer of mixed Inca and Spanish blood, says that a quarter of

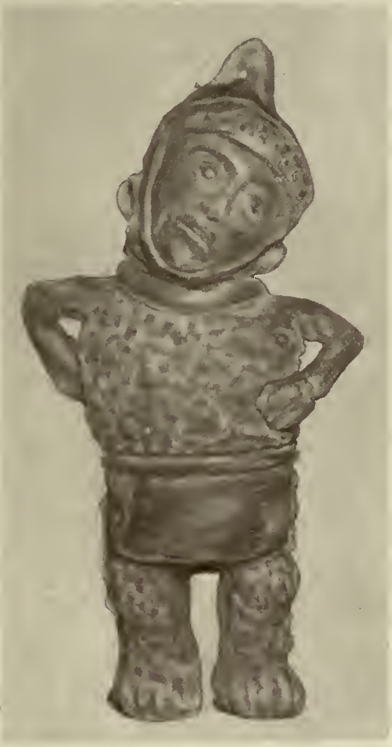

Fig. 74.—Small water-jar representation of an achondroplastic dwarf on whose body are seen the nodular eruptions of Verruga peruviana. (After Ashmead.)

---

[1] Harvard School of Tropical Medicine, Expedition to South America, 1913, 8.

[2] Zarate, Historia del discubrimento de Peru, 1545, i, 4; ii, 1.

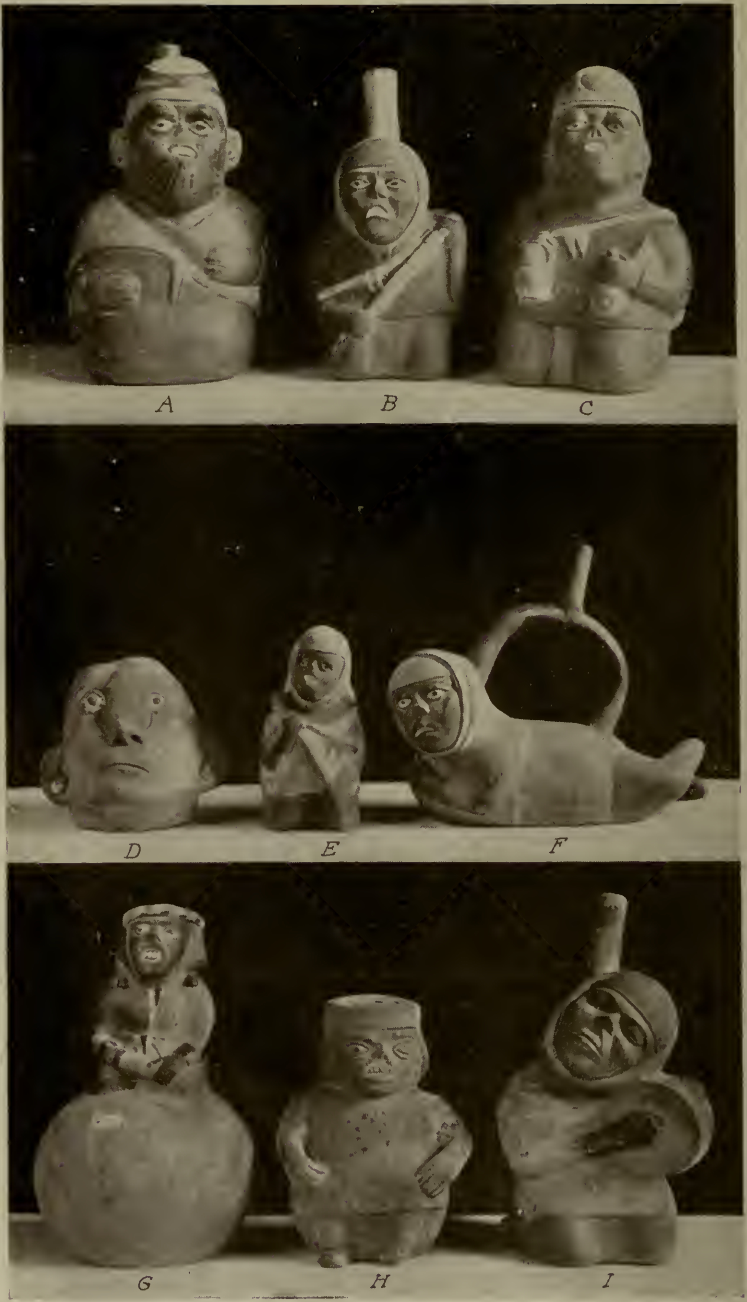

Fig. 75.

the invading army of Francisco Pizarro perished from this disease. The presence of this disease in pre-Columbian times is authenticated by the preservation of an ancient vase (Fig. 74) or water-jar described by Ashmead.[1] This pottery figure, evidently of an achondroplastic dwarf, represents a human figure (Fig. 74) whose entire body is covered with nodular eruptions in the skin. It may very well represent the Verruga peruviana.

UTA, AS DEPICTED ON ANCIENT WATER-JARS

One of the most dreaded and most widely distributed diseases (Fig. 82) afflicting the inhabitants of Peru and adjoining territory at the present time is *uta,* an ulcerative disease which has been known in Peru since prehistoric times. Lesions of the malady are frequented depicted on the "huacos" or ancient pottery of the Incas. The disease has been widely misunderstood and has been confused with other ulcerative processes, and has been regarded as a prehistoric form of syphilis and leprosy. More recently it has been regarded as a form of lupus vulgaris, or as a distinct infection. Its etiology was utterly unknown prior to the Harvard expedition to South America, when it was finally diagnosed as a form of leishmaniasis,[2] due to an undetermined species of *Leishmania.* The investigators were able to obtain the flagellate stage of the organism in cultures and to inoculate successfully a dog with it. Uta or leishmaniasis is widely distributed today, being known from Argentine northward to Mexico.[1] That it probably existed for many centuries in pre-Columbian times is indicated by the features depicted on the "huacos" or Inca pottery figured by Tamayo[2] and De Palma,[3] examples of which are not uncommon in museum collections. Several examples are shown herewith (Fig. 75) by courtesy of the American Museum of Natural History. The disease attacks chiefly the skin, flesh, and cartilage, and does not often affect the bones (Fig. 80), although occasional evidences have been seen on the various skeletal elements in the collections which seem to indicate its presence.

---

[1] Albert S. Ashmead, Photographs of Two Ancient Peruvian Vases, with Some Particularities Presented by Them, and Some Observations About Them, Jour. Cutan. and Genito-Urinary Diseases, 1895, xiii, 465–466.

[2] Richard P. Strong, Harvard School of Tropical Medicine, Expedition to South America, 1913, Chap. VI.

Fig. 75.—Water-jars from ancient Peruvian tombs showing lesions of uta, leishmaniasis, on the lips and nose. Originals in American Museum of Natural History. *A,* Erosion of lips and exposure of nasal cartilages are indicated in this pottery. *B,* Nearly normal features. *C,* Erosion of lips, nose only slightly affected. *D,* Jar showing goundou. *E,* Compare this figure with Fig. 82, showing advanced stage in uta. *F,* Slight or no effects shown. *G,* Very advanced erosion of lips. *H,* Lips eaten away. *I,* The smooth surfaces on nose and lips suggest the results of surgical interference to arrest the progress of the dread disease.

The disease must have been very prevalent in ancient times if we may judge by the frequency of its representation on the ancient potteries. The lesions depicted on the jars are those usually of the most advanced stages. The disease begins with a small, insignificant appearing papule, which gradually increases in size, and after a month or two a lesion measuring usually from 1 to 3 cm. in diameter is formed. The face, mouth, lips, ear, and neck (Fig. 75) are more commonly affected, but the ulcerations may occur on the arms or legs, being especially common in children. Some of the features depicted on the water-jars evidently represent the effects of surgical interference to prevent the spread of the disease. Such a condition is thus evidently pictured in the vase shown in Fig. 75, *I*. It is not remarkable, particularly, that the ancient Peruvians should have depicted the lesions of this loathsome disease on their water-jars, since the most astonishing work of these early Indians was their modeling and painting in clay, and it is not too much to say that not only the fauna and flora, but also the manners and customs of the people are depicted or modeled on their vases. These "huacos" have been collected and studied from early times, and Ashmead[4] especially has called attention to the pictures of pathology which some of them carry.

---

[1] Edmundo Escomel, Leishmaniasis, Buenos Aires, 1917.

[2] M. O. Tamayo, La Uta en el Peru, Lima, 1908.

[3] Ricardo de Palma, La Uta del Peru, Lima, 1908.

[4] A. Ashmead, Pre-Columbian Lupus Uta and its Surgical Treatment by Amputation of Nose and Upper Lips, as Represented on the Huacos Pottery of Peru, St. Louis Med. and Surg. Jour., November, 1900.

There is only one other type of skin lesion depicted on the "huacos," and this is shown in Fig. 73, *B*, where the seated figures are shown examining the soles of their feet, in which there are numerous rounded openings from which have been removed the egg-sacs of the "nigua," a kind of sand flea abundant in certain parts of Peru, which bores holes in the soles of the feet and deposits its egg sacs. Unless these sacs are removed entirely disastrous results are likely to ensue.

Little is known of the diseases of the teeth of the ancient Peruvians, since there have been few studies made on them. Dental practices were probably not developed among these early peoples, although certain dental procedures, though not for therapeutic purposes, have been described by Van Rippen,[1] basing his deductions on the collections at Harvard University. He established the fact that the Maya people of Central America and the primitive races of Ecuador were the first to prepare cavities in living teeth and insert inlays made to fit the cavities, without having any prophylactic measures in view. It was probably an attempt to beautify the semisavage countenance.

Thoma, also, studied a number of ancient Peruvian skeletons preserved in the Harvard collections, and was able to show the presence of dental disturbances, such as abscesses of the jaws, cleft palate, and harelip.

In a previous paper[2] I have described the practice of trephining, so that little need be said here as to the method of operation. I have thought it worth while to add, however, a description of two skulls and illustrate them to show, on the one hand, a detailed figure of the result of trephining by scraping (Fig. 76, *B*), and on the other the cause of trephining in a skull with a linear fracture (Fig. 77). In the study above referred to I mentioned skulls which showed certain variable necrotic areas, none of which are ever trephined. I am able, through the kind-

---

[1] B. Van Rippen, Pre-Columbian Operative Dentistry of the Indians of Middle and South America, Dental Cosmos, September, 1917, 1–15, 17 figures.

[2] Studies in Paleopathology, Some Ancient Skull Lesions and the Practice of Trephining in Prehistoric Times, Surgical Clinics of Chicago, June, 1919.

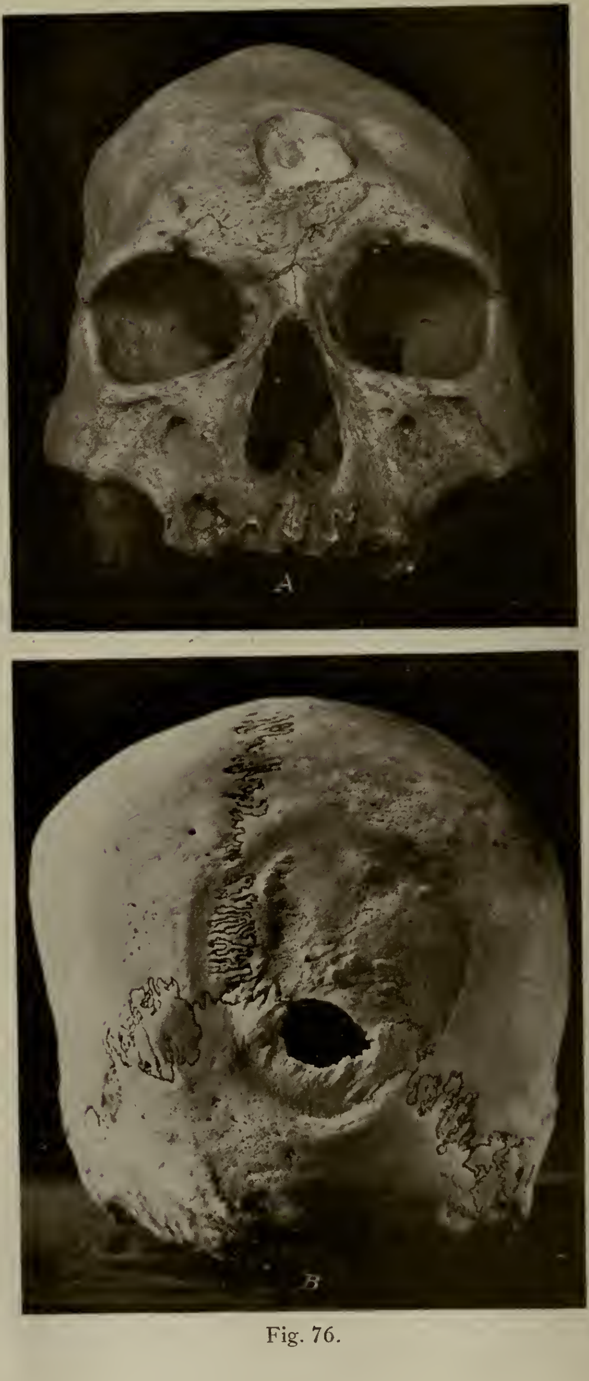

Fig. 76.

ness of Dr. George F. Eaton, of Yale University, to show a radiograph (Fig. 78) of such an ancient Peruvian skull. What the lesion is due to I haven't the faintest idea, but it is fairly common.

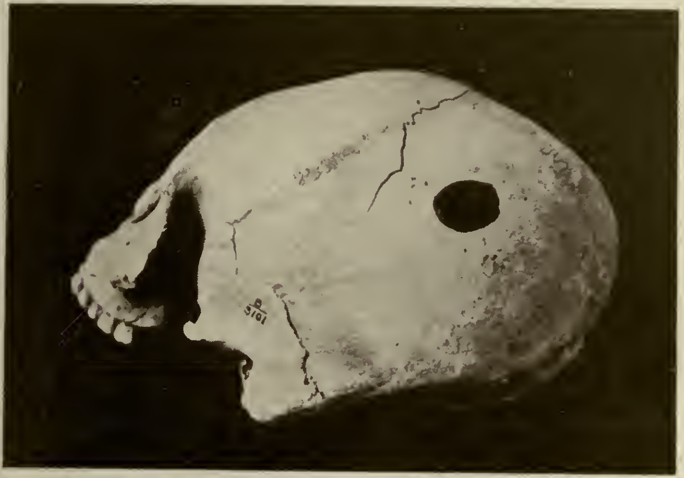

Fig. 77.—An ancient Peruvian skull exhibiting an Aymara type of deformation, caused by binding the head of the individual while young. He had suffered a transverse fracture involving the coronal suture, for the relief of which the skull had been unsuccessfully trephined. Original in the American Museum of Natural History.

The presence of syphilis among any of the pre-Columbian races of the Western Hemisphere is one of the unsettled ques-

---

Fig. 76.—*A*, An ancient Peruvian skull collected by Bandelier at Chimbote, Peru, showing in the frontal fistula evidences of bilateral pansinusitis of long standing. The fistula opens directly into the nasal chamber, through the frontal sinuses. Below the fistula the surface of the bone is quite carious, possibly caused by the pus flowing out over a number of years. Original in the American Museum of Natural History. Courtesy of Mr. C. W. Mead. *B*, Occipital view of a pre-Columbian skull from Peru showing a large trephine opening on the right lambdoid suture. A wide depressed area around the trephine opening indicates the area denuded by scraping. The wound had healed well, as may be seen by a close examination of the photograph. This picture shows especially well the effects of trephining by the process of scraping. Collected in the highlands ot Peru within 150 miles of the coast by Ales Hrdlicka. Original in the United States National Museum. Photograph from Smithsonian Institution, kindness of Dr. Charles D. Walcott.

tions in the paleopathology of the early human races. I want to present here a few of the evidences on which the statements that it *was* present, and there are many scientific men who do think so, have been based. Doctor George F. Eaton, who accompanied the Yale University Expedition to Peru to excavate the lost city of Machu Picchu, has described the skull of a child seven years of age (Fig. 79, *A*), showing on the frontal bone a deep penetrating sinus[1] which passed into the inner table of the skull, and the child doubtless perished from an infection (syphilitic?) of the meninges. It seems to me, however, that there is no reason why syphilis is involved in the question of this skull, since the sinus may well have developed from a traumatism,

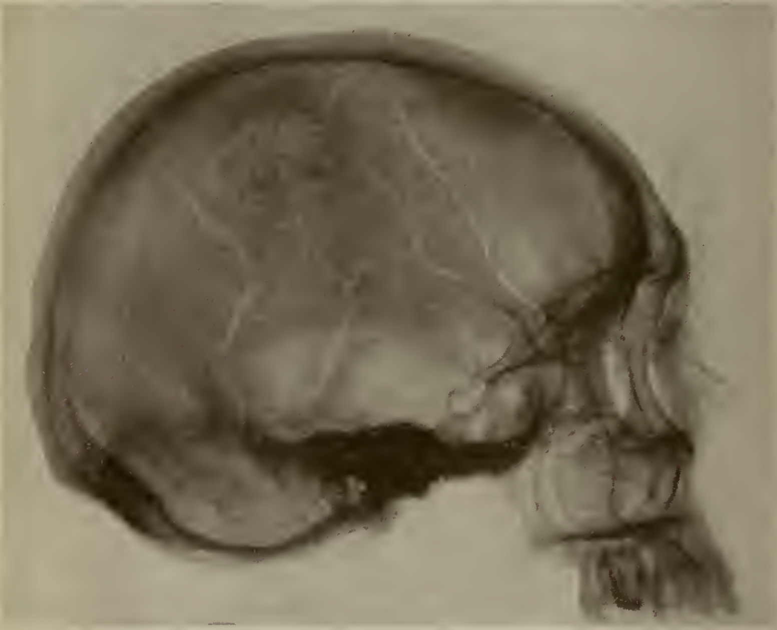

Fig. 78.—Skiagram by Dr. Eaton of an adult female skull from a cave near Machu Picchu, Peru, showing a healed lesion in the right parietal eminence.

[1] The Collection of Osteological Material from Machu Picchu Memoirs of the Connecticut Academy of Sciences, V, pl. xxiii, figs. 1, 2, 1916.

resulting in a condition similar to that seen in chronic traumatic osteomyelitis.

A saber-blade deformation of the tibia has often been said to be due to syphilis, and I figure here (Fig. 80) an ancient Peruvian tibia showing this deformity. But unless the one who makes the diagnosis is capable to distinguish between a pathologic condition and a morphologic condition his conclusions are of little value. Platycnemia is a well-established fact in anthropology and is of considerable importance, and this has often been confused by medical men ignorant of anthropology with a pathologic condition. A flattened tibia is not at all significant of syphilis by itself. Unless accompanied by other phenomena it is useless in diagnosis. Hutchinson's teeth, once thought positively diagnostic of congenital syphilis, we now know may be a result of malnutrition. The tubercle of Carabelli[1] has often been cited as a true diagnostic character of congenital syphilis, but I have shown that this character is an inheritance from man's fossil forebears. A variety of phenomena then have been regarded as syphilitic in nature, so that one is tempted to say when one meets an unknown condition, "Why, that is syphilitic," which it may or may not be.

The presence of an intense catarrhal condition of the sinuses of the face, *pansinusitis*, is indicated by a skull (Fig. 76, *A*) preserved in the American Museum of Natural History which shows in the forehead an enormous fistula from which doubtless there had been for months or even years a chronic suppuration. Through this fistula one may run a probe into nearly all the sinus paranasales, and it certainly was an intense infection. The fistula is lipped, as if an operculum of some substance had fitted into it, and the frontal bones and nasal bridge are greatly roughened.

In the collections at Yale University there is a skeleton which is extremely light and fragile. The bones are of a pale yellow color and the walls of the bones are so extremely thin that one can run a pin into the leg bones. Without a more detailed

---

[1] The Tubercle of Carabelli and Congenital Syphilis, Annals of Medical History, I, No. 4, 1919.

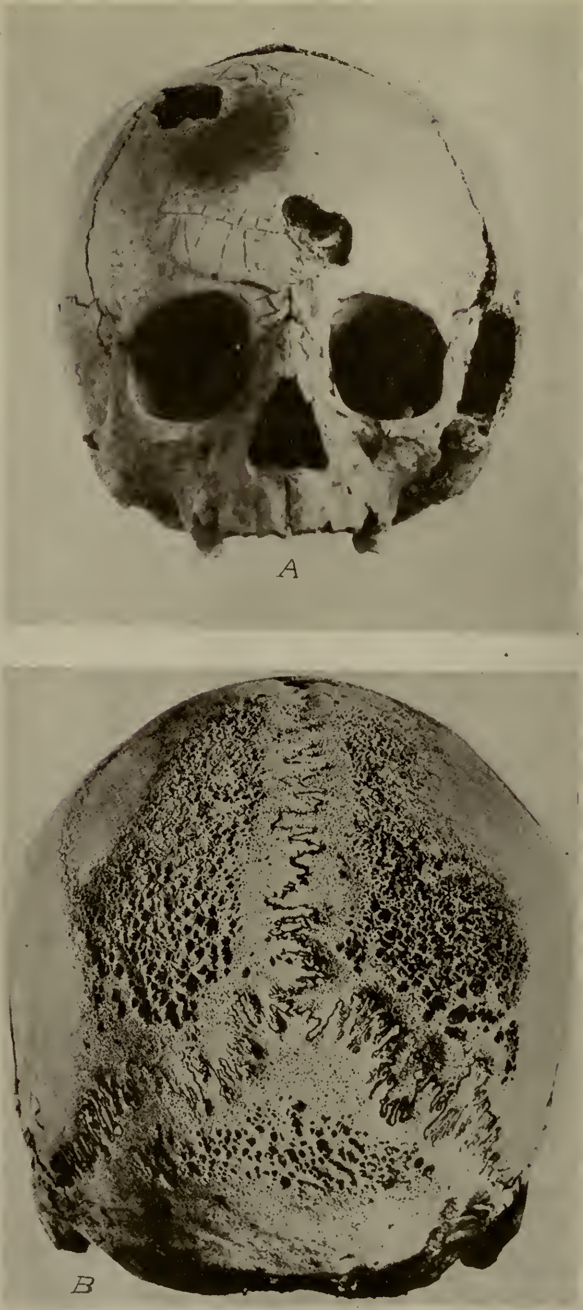

Fig. 79.

study of this specimen it would, of course, be unwise to conclude as to its nature, but it suggests a nutritional disturbance similar to that seen in osteomalacia. Other nutritional disturbances are seen among the ancient Peruvians in the porosities of the skulls (Fig. 79, *B*), frequently in children. Often these osteoporosities are paired, in the roof of the orbit, on the frontal, parietal, and elsewhere.

Occasional osteomata are met with (Fig. 83, *B*), occurring usually on the frontal, always single, never very large, and always smooth, dense ivory-like bodies exactly like the skull osteomata seen today.

The surgical implements employed by the ancient Peruvian surgeon are shown herewith (Fig. 81). They may have wiped them on their dirty, greasy blankets between operations, or they may have been rather cleanly. Judging by their descendants, they were not. They knew something of antiseptic substances as shown by the materials wrapped with the bodies of the dead, but how they employed these in surgery is not known. The surgical practices of the ancient Peruvians, other than those of trephining and amputation of the nose and lip, were confined to amputations such as that shown in Fig. 73, *A*. Other minor operations are suggested in Fig. 73, *B*.

The influence of climate on the diseases of modern races are clearly established by the work of recent times, but we do not yet know a great deal about climatic influences on ancient civilizations, although Ellsworth Huntington[1] has made a great beginning in this subject.

---

[1] The Climatic Factor as Illustrated in Arid America, Carnegie Institution of Washington, Publication 192, 1914; Civilization and Climate, New Haven, 1915.

Fig. 79.—*A*, Skull of a child, seven years of age, from a cave near Machu Picchu, Peru, presenting necrosis (syphilitic?) of the frontal bones, and an abnormal condition of the metopic suture. The black spot above the sinus is where the skull had been charred by fire, and the opening on the coronal suture is a postmortem fracture. The sinus may well have been due to traumatism. (After Eaton.) *B*, Adult pre-Columbian male skull from the valley of the Chicama, showing recovery from and the remains of osteoporosis in infancy. (After Hrdlicka.)

The ancient Peruvians embalmed their dead, though they did not by any means carry their embalming methods to such a great degree of perfection as did the ancient Egyptians. There is no indication that the Peruvians withdrew any of the viscera. The body apparently was always wrapped and allowed to dry, a very convenient method and one to which the climate was especially adapted. The bodies were kept in chulpas or tombs, caves and other places, and brought forth on feast days. When the vandals began destroying the ancient tombs in their mad search for gold the mummies, of course, were thrown aside, and

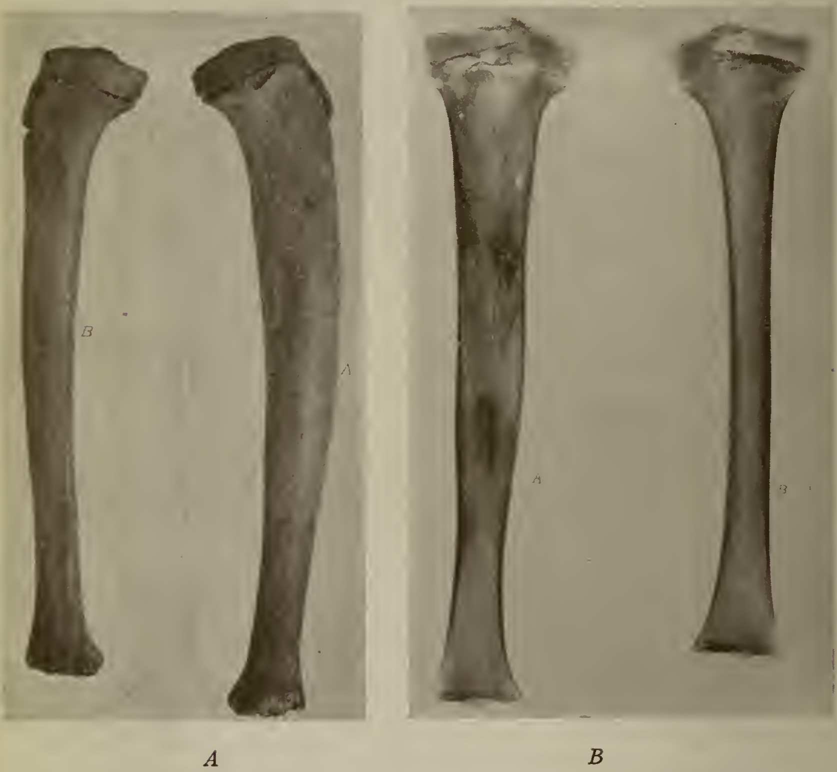

Fig. 80.—*A*, Diseased tibia with saber-blade deformity interpreted as being syphilitic. Found in a cave near Machu Picchu, Peru, by Dr. Eaton. *B*, Normal tibia, with radiograph, of a young male from the same cave. (After Eaton.)

all we have left are the undiscovered burial places and what the gold hunters failed to destroy.

Hypertrophic changes in the skull bones following an injury which had subsequently become infected are well shown in a female skull belonging to the American Museum of Natural History, recently loaned for study. The skull, supposedly of a pre-Columbian Indian, exhibits the vertex roughened and thickend as a result of an intense infection lasting months or even

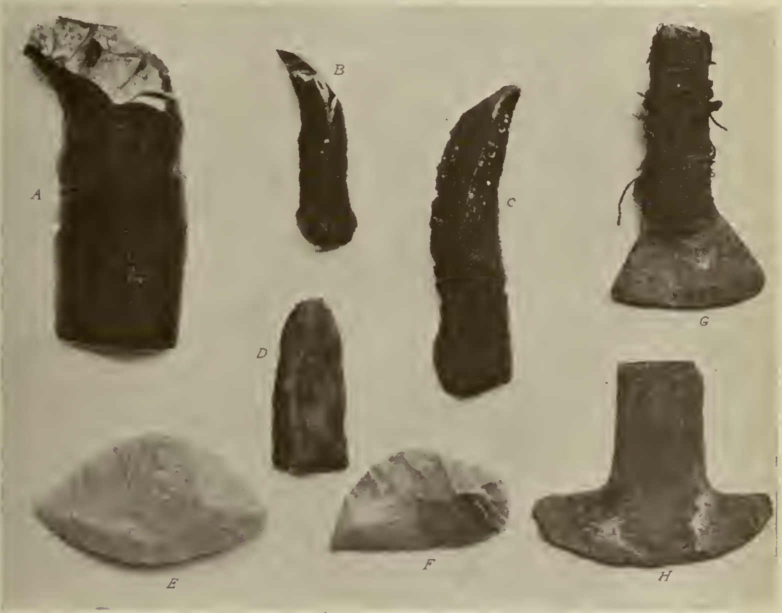

Fig. 81.—Primitive surgical instruments of obsidian and metal (copper or bronze), doubtless used by the prehistoric Peruvian surgeons in performing the operations of trephining, amputation, and incisions of all kinds. The instruments are well adapted to the various procedures involved: cutting, sawing, scraping, and boring. Collected in the highlands of Peru 150 miles from the coast by Ales Hrdlicka. *A*, *B*, *C*, Knife-like instruments which were doubtless quite effective and easly sterilized. *D*, A boring instrument, slightly injured. *E*, *F*, Scraping instruments, all of obsidian. *G*, *H*, Bronze or copper instruments to which a haft of wood was fitted and tied with thongs. Originals in the United States National Museum. Photograph from the Smithsonian Institution.

years. No attempt at relief of the infection is evident on the skull. At the inion is an immense thickening of the bone, especially apparent along the sagittal suture, and extending laterally. There is no indication of penetration into the brain case; that the individual survived the injury and subsequent infection is evident from the appearance of the bone. Other portions of the skull are normal.

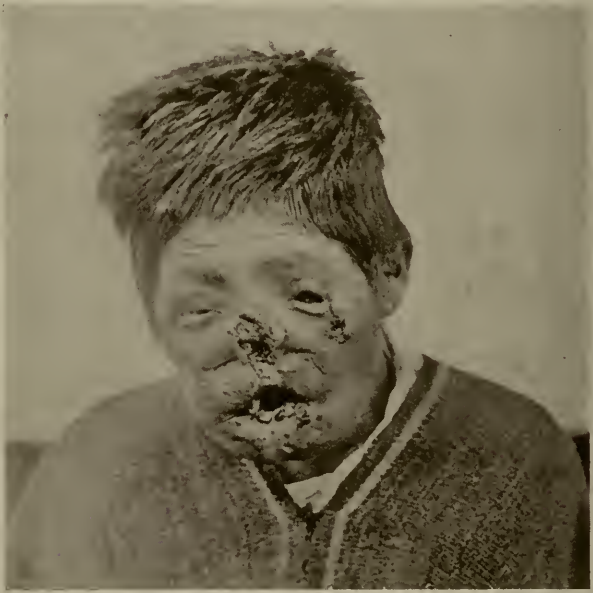

Fig. 82.—A modern Peruvian Indian showing the advanced stages in the lesions of uta. Compare with the features depicted on the ancient water jars, Fig. 75, especially *E*. (After Tamayo.)

Various arthritic conditions among the ancient Peruvians have been described by Hrdlicka,[1] and need be only briefly referred to here. Rather extensive lesions of the hip-joint are frequently seen, the femoral head often assuming a typical "mushroom" form. Various lippings and eburnations indicate arthritic disturbances so commonly seen today. Further detailed studies of ancient Peruvian skeletons are needed to establish the exact extent of these disturbances, for which there is abundant material.

---

[1] Ales Hrdlicka, Anthropological Work in Peru in 1913, with Notes on the Pathology of the Ancient Peruvians, Smithsonian Misc. Collect., Washn., lxi, No. 18, 1–69, pls., 1914.

Since this is the first survey of the paleopathology of ancient Peru which has ever been made, it would be hasty and unwise to attempt any general conclusions as to the source of the diseases indicated by the above-described remains and of their influence on the civilization and life of the people. That the influence was at times great is evident, since many of the abovementioned diseases doubtless spread over the country at times in epidemic form. There are certain springs in the mountain from which the Indians warn the rash traveler, since they say they are the source of *verruga*. The unclean habits of the modern Indians of Peru may be some indication of the unsanitary conditions among which their predecessors lived.

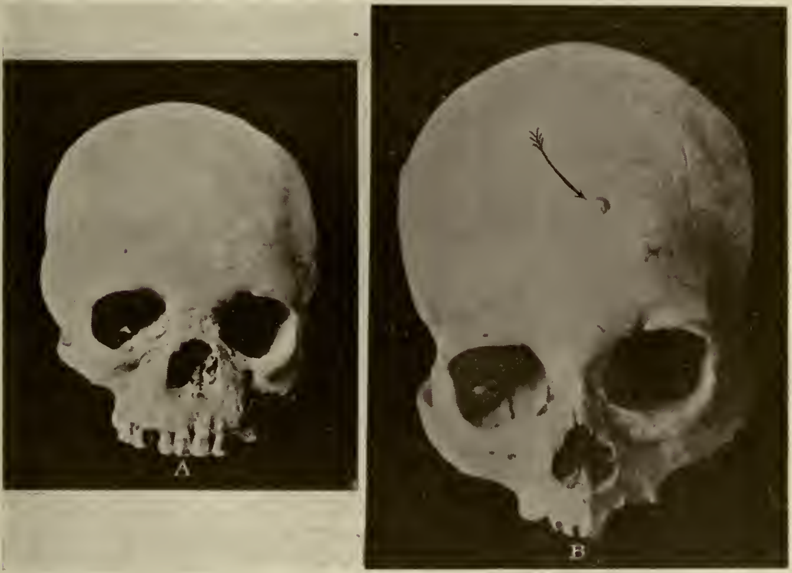

Fig. 83.—*A*, An ancient Peruvian skull showing abbreviation of the nasal region, possibly to be interpreted as a result of the erosions of the lesions of uta of long standing. *B* (at the arrow), Small osteoma on the skull of an ancient Peruvian. (After Tello.)

v 33

SURGICAL CLINICS OF CHICAGO

Volume 4 Number 2

CLINIC OF DR. A. J. OCHSNER

Augustana Hospital

PROSTATECTOMY

Summary: Perineal prostatectomy by the two-stage operation; details of the technic of preparing the patient, of operative procedure, and of postoperative management.

The patient on whom we shall operate this morning is a man seventy-seven years of age. His past history is practically negative except for an attack of bilious fever seventeen years ago. A right-sided inguinal hernia developed two or three years ago; a truss keeps it up fairly well.

Two years ago he had acute stoppage of urine. He was catheterized at the time and for about a month following the attack, after which time the function of the bladder partly returned so that he could get along, though the stream was slow and the act was followed by dribbling. He has had no incontinence and no hematuria. There has been no pain in the lower abdomen. There has been slight pain along the urethra. Five days ago he had another attack of acute stoppage of urine, for which he has been catheterized once a day since.

Physical Examination.—The patient is a robust looking, well-nourished, large individual, seventy-seven years of age, well preserved, with gray beard and hair.

Examination of the head, neck, chest, abdomen, and extremities is negative.

The bladder is distended to a point well below the umbilicus and the prostate is enlarged to approximately eight times the normal size. A soft rubber-tipped catheter, No. 8 French, can be passed without pain.

The urine is practically normal.

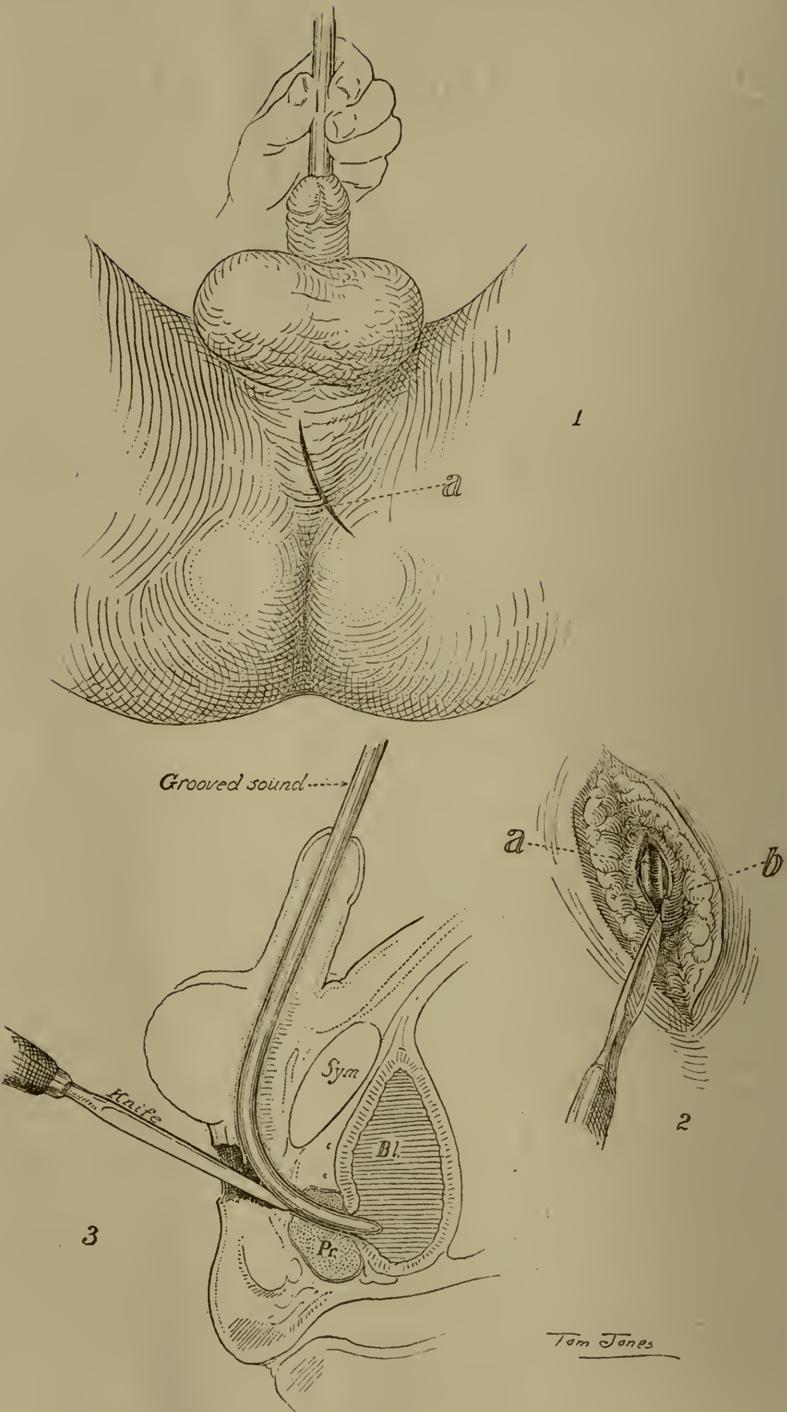

Fig. 84.

Treatment.—The patient was given 5 grains of urotropin dissolved in 8 ounces of distilled water every three hours for two days. The bladder was catheterized and irrigated for one-half hour daily with 1:4000 solution of permanganate of potash. The patient was given 2 ounces of castor oil on the day before operation and a large soapsuds enema on the evening before and the morning of the operation. One-half hour before the anesthetic was started he was given $\frac{1}{4}$ grain of morphin and $\frac{1}{100}$ grain of atropin.

The patient was anesthetized with ether by the drop method, and when completely under the influence, a catheter was passed and the bladder was irrigated with a solution of 1:4000 permanganate of potash; 500 c.c. of this fluid was permitted to remain in the bladder. An incision was made directly above the pubic bone, 3 cm. in length, down to the bladder. The bleeding vessels were all clamped and ligated at once. Then two catgut sutures were carried through the wall of the bladder directly above the pubes, each $\frac{1}{2}$ cm. to the side of the midline, leaving a sufficient space between for making an incision 1 cm. in length in the anterior wall of the bladder. This incision permitted the permanganate solution to escape. By holding the catgut sutures tense the bladder wall was drawn tightly up against the abdominal wall. Immediately after opening the bladder a double drainage-tube (Fig. 84, 2) was inserted into this opening and the remainder of the fluid was siphoned out of the bladder by means of this drainage-tube. The end (*a*) was carried into the bladder up to the point *b* (Fig. 84, 2), where the outer drainage-tube covered the inner one. The tube was then fastened in place by means of two little catgut sutures which were passed through to the outer rubber tube, but not through the inner tube, in order not to obstruct the latter and in order to prevent the accumulation of phosphates within the inner drainage-tube. The remaining space of the wound was then packed with iodoform gauze

---

Fig. 84.—1. Perineal prostatectomy. Grooved sound in urethra; line of incision shown at *a*. 2. Incision through the urethra exposing the sound. 3. Median section showing position of sound and knife just before entrance of both into the bladder.

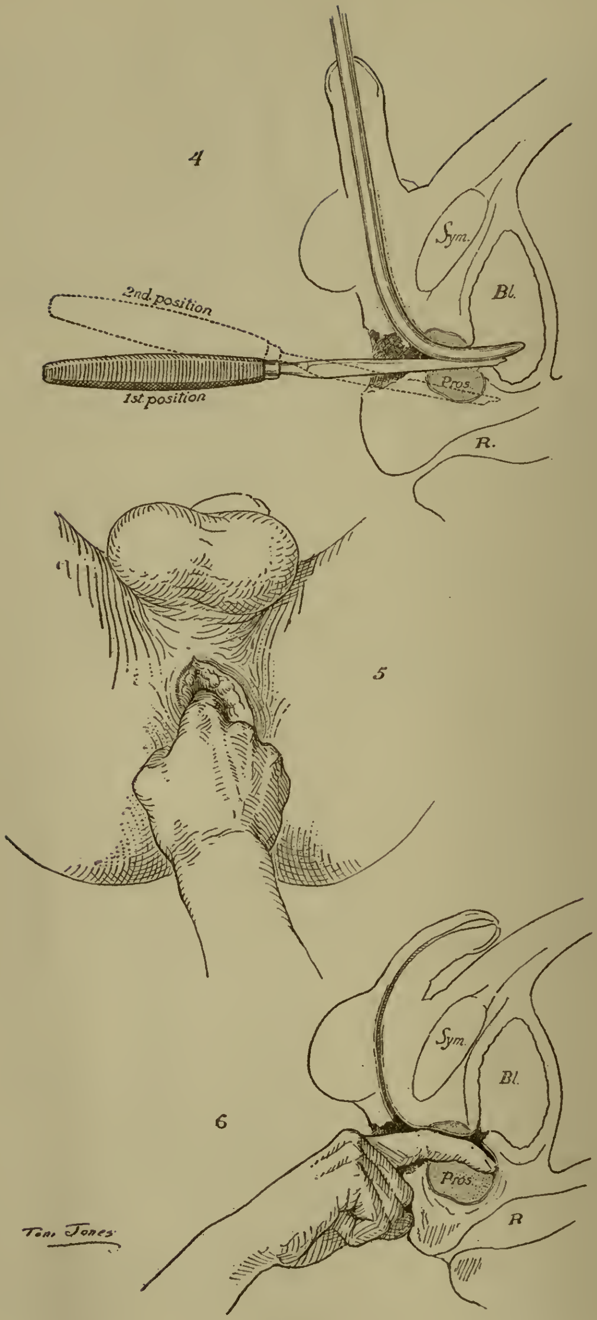
4
2nd position
1st position
Sym.
Bl.
Pros.
R.
5
6
Sym.
Bl.
Pros.
R
Tom Jones

Fig. 85.

saturated with vaselin, in order to permit any leakage which might occur around the drainage-tube to pass out without infiltrating the connective tissue of the abdominal wall. The tube was further held in position by the application of a suture through the edges of the wound in the manner indicated in Fig. 86, 10; by applying suprapubic drainage in this manner the urine can be siphoned out practically without soiling and without discomfort to the patient. This form of drainage we usually continue for one to three weeks. In the present case we continued it for twelve days, when the perineal prostatectomy was made.

In the meantime the patient received ½ pint of distilled water to which from 2 to 3 drops of dilute hydrochloric acid or from 2 to 3 grains of boric acid were added, every hour during the daytime and two or three times during the night. This will usually prevent the deposit of phosphates in the drainage-tube.

It is now twelve days since I did the cystotomy which I have just described; the patient's condition is quite favorable, and I am now ready to carry out the second step in the operative cure of this disease.

The same method of anesthetization is employed as in the primary operation, the object being to give the patient as small an amount of anesthetic as possible because of his age. The bladder is irrigated with 1:4000 solution of potassium permanganate, and the perineum is shaved and disinfected. Then a grooved sound is introduced into the urethra and through the neck of the bladder.

We now make an incision reaching half-way between the anus and the tubercle of the ischium to a point half-way between the scrotum and the anus (Fig. 84, 1). This leads us to the urethra, which is opened over the groove in the end (Fig. 84, 2). A blunt-pointed knife ground in the manner shown in Fig. 85, 4,

---

Fig. 85.—4. The lithotomy knife has been carried into the bladder. "Second position" shows the procedure of cutting through the posterior urethra and prostate. The rectum is liable to injury during this step. 5 and 6. The index-finger is carried into the bladder and a line of cleavage is found between the bladder and the prostate.

so that the blunt end will run in the groove of the sound, is introduced (Fig. 84, 3). The sharpened notch will split the urethra from the point of the primary incision into the bladder.

The urethra is slit into the bladder while it is held close to the pubic bone in order that the knife may not cut through into the rectum. It is important to guide the knife with care in order that no damage may be done while it is being passed into the bladder. This step is precisely the step that was formerly taken in performing perineal lithotomy. The damage done by this incision, if properly carried out, amounts to nothing, as has been demonstrated by many thousands of lithotomies while perineal lithotomy was in vogue. Should the knife be carried in the direction of the second position (Fig. 85, 4), it would, of course, be possible to enter the rectum, but by hugging the symphysis pubis closely with the sound this can easily be avoided. The finger is carried into the bladder (Fig. 85, 5), the grooved sound having previously been withdrawn and the knife being used as a guide, which can safely be done by turning the cutting edge away from the finger. The finger is carried entirely into the bladder and then it is carried downward laterally (Fig. 85, 6), entering the capsule through the urethra precisely as it would were one to make a suprapubic prostatectomy. It is quite as easy to discover a line of cleavage with the finger in this position as it is with the finger in the suprapubic opening. After the capsule has been loosened from the gland over the greater portion of its surface one usually encounters a few bands of adhesions which should be lifted up with the finger and caught with a pair of Kocher forceps and cut with the scissors, because these bands usually extend to the urethra, and if roughly handled may cause injury to the urethra. After one lobe has been loosened it is permitted to fall back into the capsule and the finger is carried to the other side, loosening the second lobe in the same manner. Then a pair of Young's forceps are carried into the wound alongside of the finger and the edge of the loosened gland is caught by these and is drawn out through the wound (Fig. 86, 7). The bands which still hold this lobe are caught with forceps and separated with the scissors. The second lobe is treated in the same manner and then the finger is introduced into the bladder again to search for the middle lobe or for supernumerary lobes which sometimes exist. These are treated in the same manner. Then the finger is again introduced into the bladder and the neck of the bladder is caught by means of two mouse-tooth forceps of the Allis pattern in order to hold the neck of the bladder and the edge of the capsule in position while the subsequent steps are carried out.

A double drainage-tube (Fig. 86, 11) with perforations is carried into the bladder, using the finger as a guide. The tube is introduced to the point *b* (Fig. 86, 11). The object of passing this portion of the tube double lies in the fact that it will be possible to tampon against this double tube without causing its collapse. While the neck of the bladder and the capsule of the prostate are held in position by forceps *a-a* (Fig. 86, 8) a loop of gauze (Fig. 86, 8, *c*) is snugly tucked into the capsule of the prostate gland against the double tube, the wound itself being held open by long flat retractors which reach to the edge of the capsule. After the packing has been accomplished the retractors are removed and the rubber drainage-tube is fastened in place (Fig. 86, 10). It is practically always possible to control hemorrhage completely by this tampon. The suprapubic drainage-tube is left in place in case clots of blood accumulate in the bladder, which occurs very seldom. The bladder is irrigated through the suprapubic tube and the clots permitted to wash out through the perineal tube.

The perineal tube and the gauze will be removed on the second day after operation, when they will have accomplished their object of controlling the hemorrhage. The suprapubic tube will be left in place for one week after completion of the operation.

The patient will be permitted out of bed at the end of from three days to one week. Urine begins to pass normally from ten to twenty days after the operation.

The use of the distilled water will be continued until the suprapubic drain is removed. The patient will be permitted to take hot tub-baths daily after one week following operation.

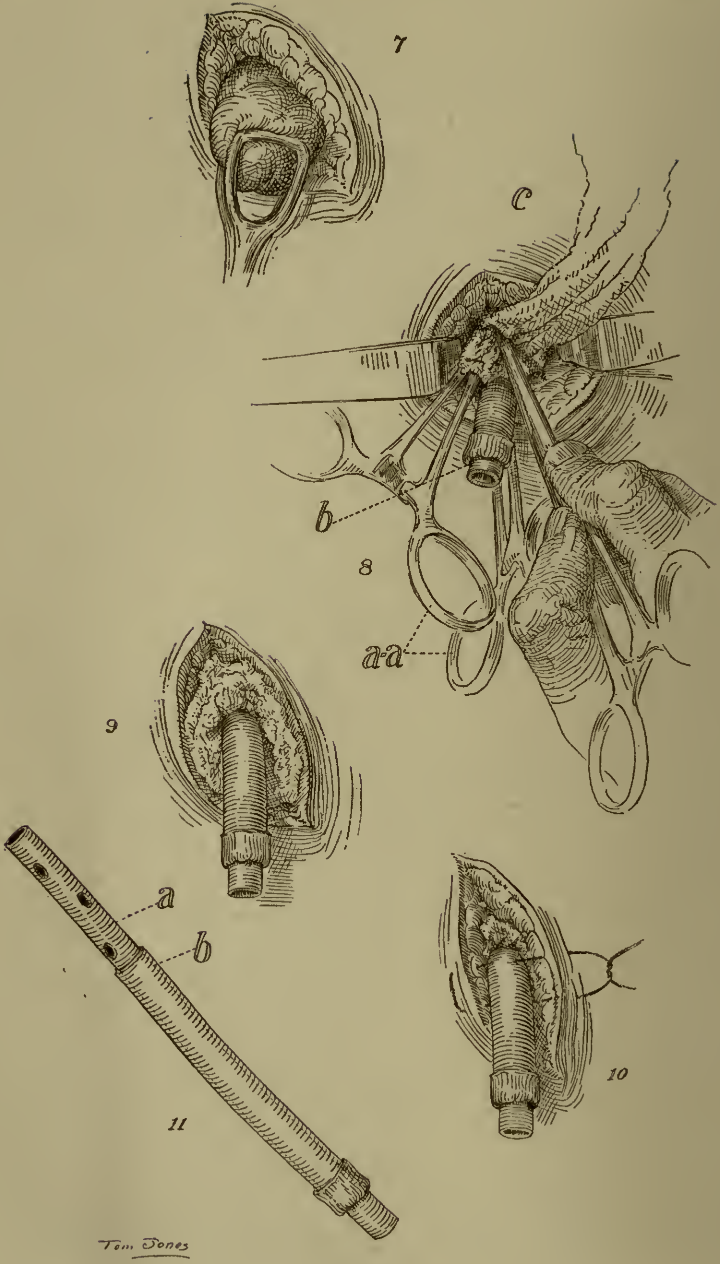

Fig. 86.

Note.—This patient was discharged from the hospital ten days after the second operation.

The advantage of the technic here demonstrated lies in the fact that it can be performed in the same time that it is possible to make a suprapubic prostatectomy and through a much smaller incision and with less traumatism to the patient. The small suprapubic incision that is necessary to drain the bladder preliminary to the perineal prostatectomy does not give the great discomfort to the patient that is usually experienced after the suprapubic prostatectomy. Neither does it involve so extensive an adhesion of the anterior surface of the bladder to the abdominal wall. The method also provides for very satisfactory natural drainage through the perineum which is far more cleanly than is usually observed in suprapubic prostatectomy. In cases in which the patient is younger and in which the obstruction is of only mild degree, where there is no cystitis and certainly no involvement of the kidneys, a perineal prostatectomy can be done safely without the preliminary cystotomy, but in any case in which there is doubt it is always best to make a preliminary suprapubic cystotomy.

For some time we practised suprapubic drainage by inserting a trocar into the distended bladder and then slipping a catheter through the trocar into the bladder and withdrawing the trocar, leaving the catheter in the bladder and fastening it in this position for the purpose of drainage, but in several cases we experienced infiltration of the connective tissue in front of the bladder, so that we have abandoned this method entirely and have substituted the method described in this patient.

In many cases we have employed spinal anesthesia with entirely satisfactory results. In these cases we have given the

---

Fig. 86.—7. The prostate gland (one lobe) isolated except at urethra, from which it is severed by means of scissors, and removed in the grasp of a pair of Young's forceps. 8. Two forceps (*a-a*) are clamped on the edges of bladder, the drainage-tube (*b*) is inserted, and a strip of gauze (*c*) is packed around the tube and into the prostatic space. 9. Drainage-tube and packing in position. 10. Method of suturing tube in place with silkworm-gut. 11. Detailed drawing of drainage-tube made up of an inner tube (*a*) and an outer (*b*), the inner tube having several small perforations.

patient $\frac{1}{4}$ grain of morphin and $\frac{1}{100}$ grain of atropin one-half hour before injecting the solution of apothesine into the spine, and have waited for twenty minutes after the injection of this fluid before undertaking the perineal prostatectomy. Then we have carried out the operation of prostatectomy precisely as described above, the patient usually conversing with one of the assistants throughout the period of the operation. The spinal anesthesia is employed according to the well-known plan, which I believe is generally practised by the many surgeons who make use of this method in preference to a general anesthetic. This method was described by Dr. D. A. Orth in the Surgical Clinics of Chicago, February, 1919.

In all these patients of advanced age we elevate the head of the bed from 12 to 18 inches in order to prevent hypostatic congestion of the lungs. We also prefer to keep these patients in bed for a number of days before the primary operation, because they seem to become accustomed to being in bed and seem to show less tendency to postoperative pulmonary congestion.

CLINIC OF DR. HERMAN L. KRETSCHMER

St. Joseph's Hospital

CARCINOMA OF THE BLADDER

Summary: Diagnosis of carcinoma of the bladder usually made at a time when effective treatment is no longer possible because of failure to appreciate import of early symptoms. Necessity of cystoscopic examination in all cases of hematuria. Operation—resection of tumor—technic of closure of bladder wall. Comments on diagnosis and treatment of bladder tumors.

The patient we have for operation this morning is Sister M. C., aged forty-eight, who gives the following history:

Her family history is negative. At the age of seventeen the patient was sick in bed for six months; at that time the diagnosis was uric acid poisoning. Menstruation has always been regular, and ceased in May, 1918, just preceding the onset of the present trouble.

Hematuria was the first symptom the patient noticed, and this began in May, 1918. The hematuria was not present constantly, and there were often intervals of a week between the attacks of bleeding. Sometimes the blood was passed at the end of urination and at other times the urine and blood were well mixed. Large clots of blood have been passed from time to time. The hematuria continued without pain from May until October.

Painful urination began in October, 1918, and was described as burning in character. The pain was present during urination. The patient states the pain was also present in the bladder at all times, becoming more severe after urination. There was also present a sharp lancinating pain which radiated up along the spine when the patient was lying down.

Pyuria began in October. Frequency also began in October, at which time she was obliged to void fifteen to twenty times during the day and twenty to twenty-five times during the night. The patient states that very little urine is passed at a time. During the past four weeks this symptom has not been quite so pronounced.

During the past summer the patient noticed that there were small pieces of tissue passed with the urine, and occasionally these were passed with clots of blood.

Polydipsia began in October. It came on suddenly and has been very severe.

Physicial Examination.—Head, neck, heart, and lungs are negative.

Abdomen.—There is a good deal of tenderness upon pressure in the epigastrium. The liver is not enlarged. The kidney and spleen are negative. The patient complains of some tenderness upon pressure over the bladder.

Reflexes, glandular system, and extremities are all negative.

Urinalysis shows the presence of albumin and blood, pus-cells, and epithelial cells. A culture shows the presence of colon bacilli and staphylococci.

Blood examination shows 3,490,000 red cells; 8150 white cells, and 75 per cent. hemoglobin.

Blood-pressure is 150 systolic and 90 diastolic.

Roentgen ray examination is negative for stone in the urinary tract. Roentgen ray examination of chest for possible metastasis in lungs is negative.

Cystoscopic Examination.—This was painful and difficult owing to the limited bladder capacity. Only 2½ ounces of water could be introduced into the bladder. This examination showed the presence of a large tumor at the junction of the posterior and superior walls of the bladder. The tumor was surrounded by edema. The surface of the tumor was irregular and on it were large necrotic shreds.

There are two things of interest in this patient: first, the relatively long duration of the symptoms; second, the location of the tumor. The hematuria began painlessly, and the patient states very definitely that there were no symptoms other than painless bleeding for six months. After October the symptoms became violent very rapidly and the patient suffered intense pain. During October the patient passed fragments of the tumor, and yet with this history the patient has gone on for one year before being cystoscoped. The patient represents the average patient who comes to the genito-urinary surgeon seeking relief for carcinoma of the bladder. Unfortunately, no attention is paid to the hematuria, and many of these patients are treated symptomatically, so that when they do come for relief, surgical treatment is out of the question. It is unfortunate that these patients are not seen earlier, because I believe that the results of surgical treatment of tumors of the bladder could be very materially improved as regards the end-results if these patients were started on the road to treatment as soon as the first symptoms were noticed. Instead, the patient comes to us late in the course of the disease, owing to the fact that there has been too much procrastination.

The second point of interest is that this tumor is located in a part of the bladder which allows wide resection of the tumor. Most of the tumors of the bladder occur in the region of the trigone, involving one or both ureteral orifices, or around the neck of the bladder, parts of the bladder which anatomically and physiologically do not lend themselves to resection as readily as do the superior or posterior walls.

Microscopic examination of some of the tumor fragments that were obtained in the wash-water at the time of cystoscopy showed the presence of a very rapidly growing carcinoma.

After considering the facts it was decided to operate on this patient, and it is my plan to carry out a wide resection of the tumor.

The bladder having been filled with water and the patient put in the Trendelenburg position, I will make the usual suprapubic incision extending from the symphysis pubis to the umbilicus. The incision is carried through the fascia of the rectus muscle and the fibers of the rectus are separated with the blunt end of the scalpel. The peritoneum is dissected back with a piece of gauze. Owing to the fact that we wish to perform a very wide resection, I will carry the peritoneal dissection well

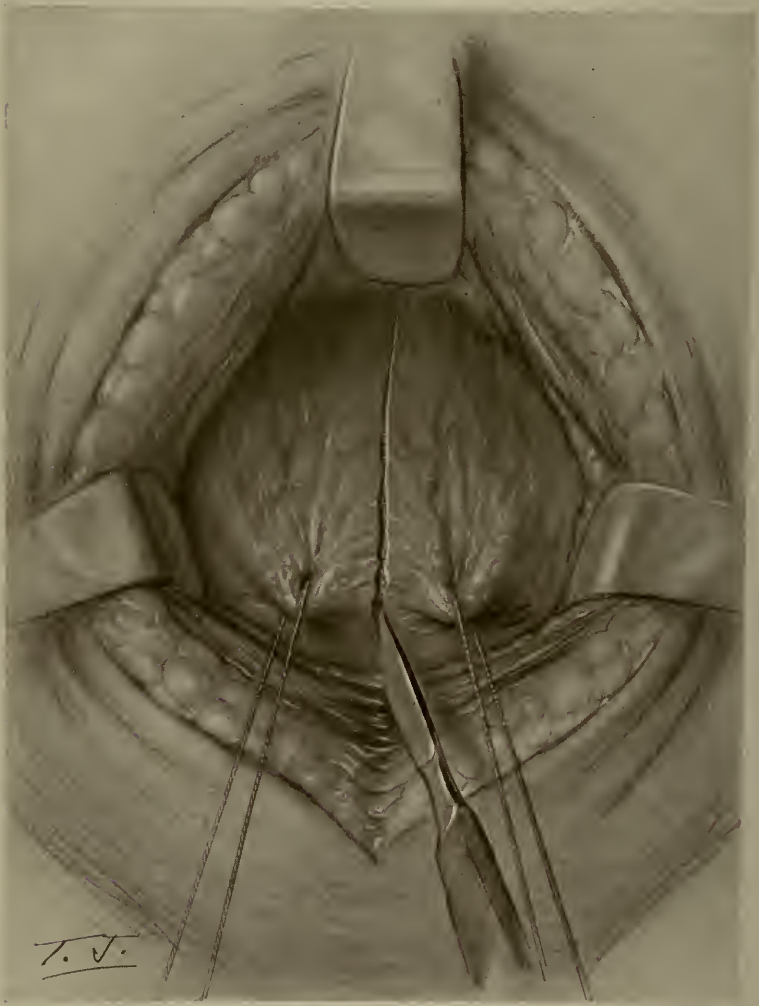

Fig. 87.—The peritoneum has been stripped back as far as the base of the bladder. A long incision is made between the two silkworm-gut sutures.

down toward the base of the bladder. In order to lift up the bladder and facilitate stripping the peritoneum from it I will place two large sutures of braided silk in the bladder, one on each side of the median line (Fig. 87). These can be used as traction sutures. In dissecting the peritoneum from the bladder a large, peculiarly hard area is felt at the junction of the superior and posterior walls of the bladder. This hard area is the tumor which we saw with the cystoscope. In view of the fact that the tumor is much larger than I thought it was from the cystoscopic picture, I will open the peritoneal cavity to determine whether or not any metastases can be seen or felt. Not being able to feel or to see any signs of metastases in the peritoneal cavity, I will close the peritoneum with fine catgut and the dissection of the peritoneum will be continued down to the base of the bladder.

A long median incision is now made into the bladder cavity after having first packed the abdominal wound with large gauze sponges in order to pick up the water that escapes through the incision. When the bladder is opened a large tumor, as you see, immediately comes into view. No doubt the size of the tumor was underestimated owing to the fact that proper distention of the bladder could not be obtained. Attention was called to this limited bladder capacity in reading the history.

Now that the bladder has been dissected free and the cavity opened, the next step is to apply two long clamps, one at each side of the tumor. Owing to the fact that we have plenty of room the clamps can be so placed that the incision passes at least 1 inch away from the margins of the tumor. The clamps are applied obliquely so that their distal ends meet (Fig. 88). With the scalpel the entire tumor and the bladder wall between the clamps is excised in one large mass. There is no bleeding, as you will see, owing to the fact that the clamps take in the entire thickness of the wall of the bladder.

Closure of this incision is effected by bringing the two clamps together and introducing a continuous suture of catgut, care being taken to see that the suture passes through all the layers of the wall of the bladder except the mucous membrane (Fig. 89). As you see, this is done rapidly, and is not a very difficult procedure in this instance, owing to the fact that the bladder is quite mobile and the patient is a thin woman with thin abdominal walls. The sutures are tied at the upper end and the clamps removed. A second row of catgut sutures will be placed over the first to reinforce it. We will now close our first incision in the bladder in the same manner and insert a small rubber

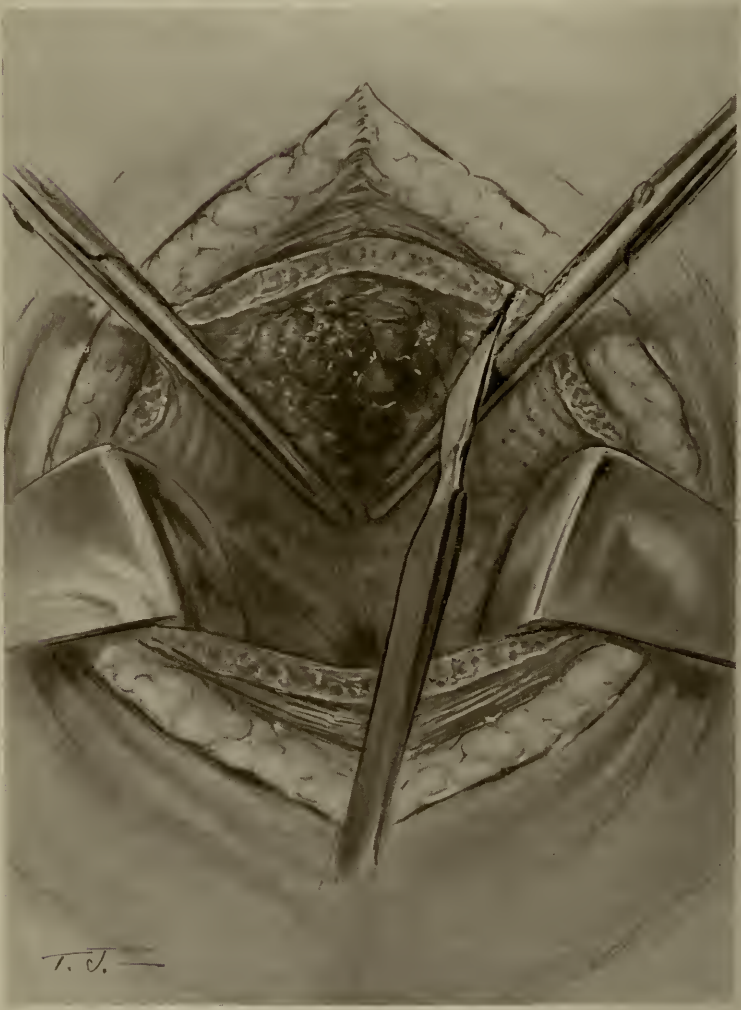

Fig. 88.—The clamps, one on each side of the tumor, have been placed so that the incisions by which the tumor is excised pass at a safe distance from the neoplasm.

drain into the bladder cavity. A large strip of iodoform gauze will be packed between the bladder and the peritoneum behind,

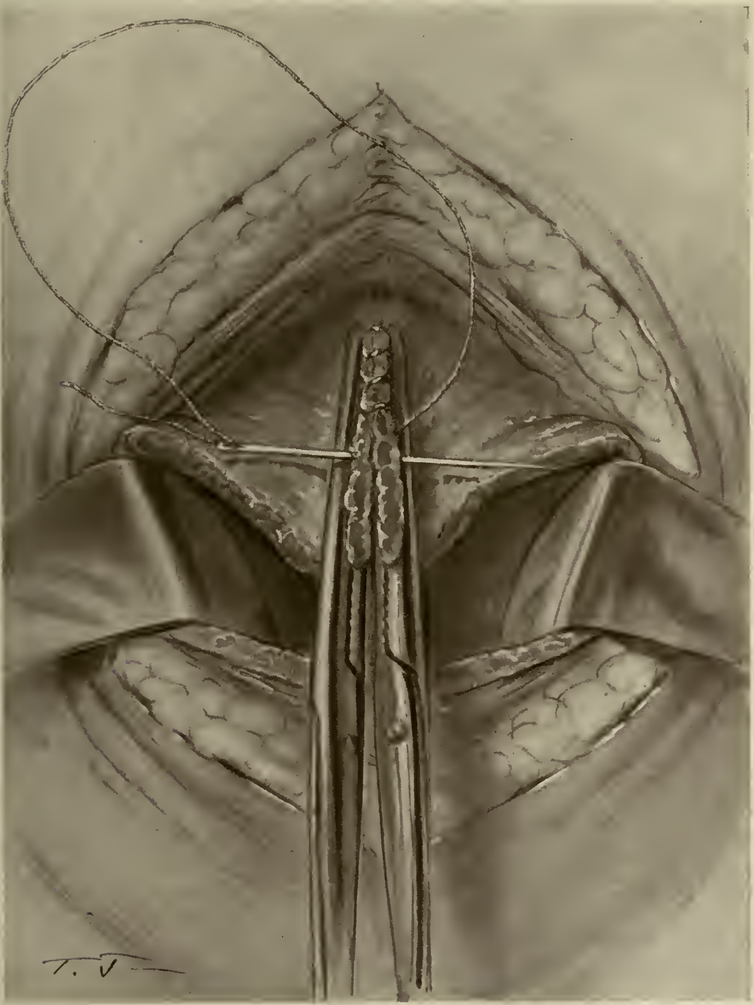

Fig. 89.—The clamps have been approximated and the first layer of catgut sutures is being passed through the bladder wall. The mucous membrane is not included in this suture.

and a small strip will be placed between the bladder and rectus muscle in front.

Note.—The histologic examination of this tumor was made by Dr. W. H. Burmeister, Pathologist to St. Joseph's Hospital, who reported a carcinoma of the bladder. His description states that it is a nodular polymorphous-celled carcinoma, growing in solid cell masses of alveolar structure with very definite stroma septa (Fig. 90).

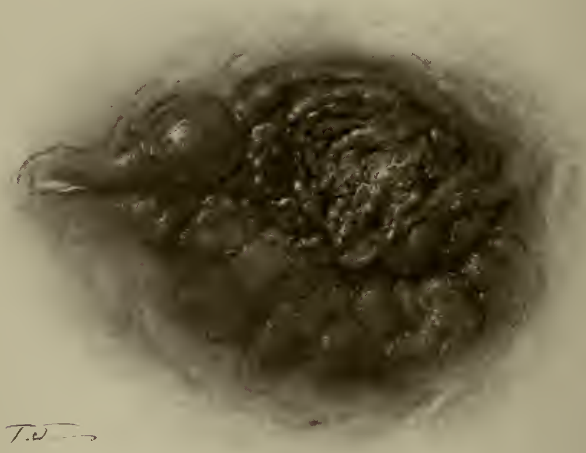

Fig. 90.—Specimen after removal; note areas of necrosis on the surface of the tumor.

COMMENTS

The treatment of malignant bladder tumors offers no exception to the sound surgical principles that underlie the treatment of malignant tumors in any other organ of the body. The results obtained in the treatment of vesical neoplasms are in direct ratio to the time at which the patients are brought in for treatment. In other words, the same rule applies here that applies to the treatment of carcinoma of the breast, uterus, stomach, and carcinoma elsewhere. In the majority of patients which one sees every year, one is called only to make the diagnosis, because the question of treatment is out of consideration owing to the fact that the patients are beyond surgical relief. Not only is this true in private practice, but it is especially true in hospital practice. I believe the results in the treatment of carcinoma of the bladder could be very much improved if, by education, the patients could be made to seek treatment early. I think it is a perfectly fair statement to make that the largest percentage of tumors of the bladder that one sees in hospital practice come to one at a time when the outlook is absolutely hopeless, and this statement holds true with a good many of our private patients as well.

The diagnosis of tumors of the bladder can certainly be made very easily and quite definitely. I think that perhaps the reason that these tumors are overlooked is because the possibility of bladder tumors in so many of these cases is not thought of. So many times the patients are told that they have chronic cystitis, an irritable bladder or nephritis, and are treated accordingly. The simple fact that the patient has bladder distress or hematuria, or both, and the fact that the patient is of cancer age should be enough evidence to warrant a thorough and complete examination, so that carcinoma may be excluded if it is not present. Many of the patients who have symptoms extending over a long period of time are treated first with medicine and then with local applications to the bladder, all without relief, and then when they come with this history one can almost make the diagnosis from the history alone.

The history should be carefully elicited and due consideration should be given to the history after it is obtained. The history in these cases is of prime importance, especially if you are the family physician, who, as a rule, is the first one to see the patient.

The physical signs early in the course of the disease are, of course, practically negative. It is perhaps because of this fact that so many cases are not recognized. The patients have no tenderness in or around the bladder. There is no change in the rectal findings in men or in the vaginal findings in women. When the physical signs are marked in the majority of instances it is too late to promise the patient very much in the way of a complete cure. By the time that vaginal examination reveals an enormously thickened base of the bladder or a thickening in the posterior wall of the bladder, or when the vaginal wall shows a good deal of infiltration, a radical operation is impossible. In the later stages, when a large mass can be felt in the suprapubic region, it is needless to say that this diagnosis as far as the patient is concerned is without value. In patients of the cancer age with bladder symptoms one should never consider the examination complete unless the patient has been examined by the cystoscope. By means of cystoscopy one can easily demonstrate or exclude the presence of a neoplasm. Because so many of these patients have hematuria, it would be a good rule to have each patient with hematuria, especially patients of the cancer age, examined with a cystoscope. The cystoscopic examination enables one to demonstrate at once the size and location of the tumor or tumors in cases in which they are multiple. One can demonstrate and quickly determine the exact relationship to the ureteral orifice and neck of the bladder, which is important in considering surgical interference. As a general proposition one can make a fairly accurate diagnosis as regards the nature of the tumor from the cystoscopic examination alone.

The most frequent tumor, as you know, is the so-called benign papilloma. This has been described to you many times and presents a picture familiar to all. The tumor, as a rule, has a pedicle and is more or less freely movable. The fimbriated portions of the tumor wave in the media with which the bladder is distended and the small blood-vessels can be seen in the ramifications of the tumor. When one sees this picture it is fair to assume that one is dealing with a so-called papilloma of the bladder.

In frank cases of cancer of the bladder and tumors of the epithelioma type, one can likewise make a definite diagnosis. However, a great deal of difficulty may be experienced in the diagnosis of benign tumors which have undergone malignant change. Some of the cystoscopic data may help us out in the differentiation. A tumor, for example, may appear at first sight to be a benign papilloma. Upon closer examination, however, the bladder mucosa may show a definite amount of edema around the tumor, so that the mucous membrane is swollen and fluffy. Not infrequently one sees changes in the blood-vessels around the base of the tumor. In malignant tumors they are large, tortuous, and dilated. Occasionally one finds areas of necrosis in the tumor, so that you see one has several very good guides in putting one on the lookout for the possibility of a malignant tumor.

In rare instances it may be impossible to differentiate and to make a definite diagnosis. In such instances two courses may be open. One of these would be to resort to microscopic examination of pieces of the tumor removed by one of the various types of operative cystoscopes. This procedure is questioned by some because of the possible danger of causing the tumor to spring into activity. This method has also been criticized because one might remove a piece of the tumor that is normal, and hence lead to an incorrect diagnosis. My practice has been to resort to removal of pieces of tissue for histologic study in cases in which any doubt ever arises in my mind regarding the nature of the tumor. In the majority of instances this is not necessary because one can differentiate with the cystoscope.

Now then, whenever a case occurs in which I desire, for one reason or another, to obtain a histologic section I have no hesitation whatever in removing a small piece for histologic study. Instead of resorting to the removal of a piece of tumor for study, one may examine the fragments of the tumor that are found in the wash-water during cystoscopic examination. I never fail to take advantage of this fact, as we did in this case today. The patient told us that she had been passing pieces of tumor for the past six months, and so when we irrigated the bladder previous to the cystoscopic examination we were on the lookout for fragments of tumor, and we were rewarded by obtaining a half-dozen pieces of tumor as large as peas, which were subjected to histologic examination and which showed a very rapidly growing carcinoma. In certain instances fragments may not be obtained in this way, and then we may resort to the use of the high-frequency spark.

In benign papillomata one or two applications of the high-frequency spark will have a favorable therapeutic effect, namely, it will cause a rapid diminution in the size of the tumor. Many men have claimed that if a tumor is subjected to the high-frequency spark and if there is not an appreciable change in the tumor after one or two applications, such a tumor can be or should be considered a malignant tumor, as it is uniformly recognized and admitted that the high-frequency spark is of little value in frank carcinoma.

Ordinarily I do not believe that the difficulty in making a diagnosis is very great if the patient comes to the genito-urinary surgeon early. I think the difficulty in this class of cases arises from the fact that these patients are not brought to us early in the course of their disease. It has also been recognized that many tumors of the bladder that have been diagnosed carcinoma as the result of histologic examination have been caused to disappear by the use of the high-frequency current. On the other hand, there are cases in which a diagnosis of benign tumor has been made and in which the high-frequency current has failed to give relief.

The question of the use of radium in this instance may be discussed. I believe that in view of the fact that the patient's general health is so good and the tumor is located in a part of the bladder which lends itself most admirably to resection, one is justified in adopting the line of treatment which has been demonstrated today in preference to the less radical procedure involved in the use of radium.

CLINIC OF DR. EDWARD LOUIS MOORHEAD

Mercy Hospital

RUPTURE OF QUADRICEPS EXTENSOR TENDON: OPERATION; RESULT

Summary: A case of rupture of the quadriceps tendon presented for treatment four months after the original injury. Diagnosis. Treatment—tendon lengthening. Result six months after operation.

The first patient this morning is shown that you may see the end-result of an operation which was performed six months ago.

She is an unmarried American woman twenty-five years of age. She presented herself to us six months ago with the following history: Four months previously, in alighting from a buggy on a rough country road, her right foot slipped and she fell beneath the buggy. She was unable to rise or to stand alone when assisted to her feet by her companions. They had her removed to her home and a physician was called to attend her. Their statement is that the diagnosis of the injury made by the physician at that time was not quite clear. However, the patient was put to bed and a plaster-of-Paris cast applied to the entire limb. This cast was allowed to remain for six weeks, when it was removed and liniments and other applications were used on the limb. She states that during all this time she was assured that the limb would be all right, but there was no improvement at all and she was unable to use the limb.

Four months from the date of receiving the injury the patient was brought to the hospital for treatment. At that time the following points are noted in her history:

"Patient well developed; weight 160 pounds; no history of any previous injury or illness. Examination of head, chest, and abdomen negative. Examination of extremities negative except for the right limb. The patient is able to flex the right leg upon

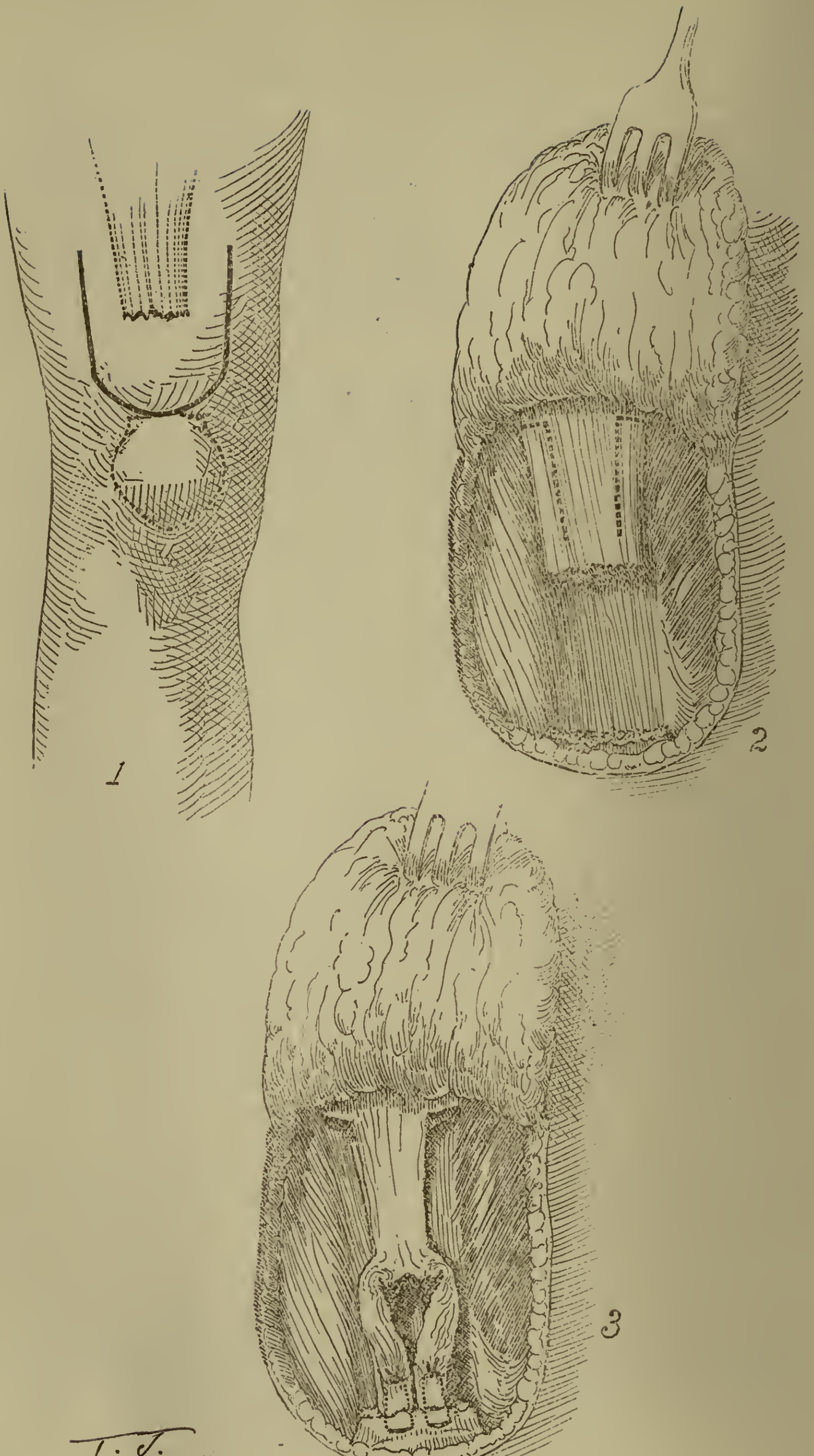

Fig. 91.

the thigh, but is unable to extend it. Lying upon her back she is unable to lift the right limb or to flex the thigh upon the abdomen. She is unable to stand erect upon her feet, even with assistance, and cannot place any weight upon the right foot. There is a slight atrophy of the muscles of the right thigh and leg, presumably the result of non-use.

"By manipulation no fracture of the patella or the bones of the leg or thigh can be determined. Careful examination of the anterior surface of the thigh reveals the patella in proper position, but there is an apparent separation of its upper edge from the quadriceps extensor tendon. This separation is about 2½ inches, there being quite a depression between the patella and the upper detached end of the tendon. The *x*-ray plates made at this time did not show any fracture or injury to the bones."

The condition, therefore, with which we had to deal was a rupture of the quadriceps extensor tendon, produced by violent muscular contraction when the patient slipped and fell beneath the buggy.

What was to be done for a condition such as this? Remember that the injury was four months old and the muscles had retracted about 2½ inches. It was hardly probable that we would be able to bring down the torn end of the tendon and suture it to the patella, as the traction on the sutures would be too great. We therefore decided upon the following procedure, which was carried out:

After proper preparation the patient was anesthetized with ether. A semicircular incision with the convexity downward and extending over the upper edge of the patella was made with a vertical arm extending upward on either side of the tendon a distance of about 3 inches (Fig. 91, 1). The flap of skin and superficial fascia was reflected upward, exposing the ruptured tendon. The tendon was freed from the surrounding adhesions and an attempt was made to bring it down in apposition to the patella. This could not be accomplished on account of the marked retraction of the muscle. It was then decided to lengthen

---

Fig. 91.—1, U-shaped incision for exposure of ruptured tendon. 2 and 3, Tendon lengthening as practised in the case demonstrated.

the tendon. An incision about $\frac{1}{2}$ inch deep was made on either side of the tendon about 3 inches above the torn end, and the strip formed on either side separated downward to within 1 inch of the torn end of the tendon (Fig. 91, 2). These two strips, now forming a prolongation of the tendon, were sutured without any tension to the patellar end of the torn tendon by mattress sutures of kangaroo tendon (Fig. 91, 3). The fascia was closed with catgut sutures and the external wound with interrupted silkworm-gut sutures without drainage. A plaster-of-Paris cast, encasing the entire limb in a straight position, was applied.

The postoperative history was uneventful. There was very little discomfort and the wound healed primarily. At the expiration of four weeks the cast was split and passive motion was begun. The limb was replaced in the cast after each exercise and the cast held in place by a roller bandage. The patient made very good progress, and eight weeks following the operation she was permitted to be transported to her home 600 miles distant. At that time she could flex the thigh upon the abdomen and extend the leg fairly well. She wore the retentive dressing on her limb during the journey home, and was instructed as to the proper management of the limb in after-care.

Today, six months from the date of the operation, the patient returns that we may see the result. She is able to flex the thigh upon the abdomen, to extend the leg, and walks without any apparent difficulty. The result is all that could be desired.

The lesson to be learned from this case is—be more careful in the examination of injuries about joints. Where you are unable to demonstrate either by manual examination or *x*-ray plates any injury or fracture of the bones, do not forget that there may be serious injury to the tendons. Because the joint is swollen and you have been unable to find a fracture, do not be satisfied and call it a sprain. Repeated and careful examinations may reveal to you the true nature of the injury and save you much trouble later.

VARICOCELE

Summary: Etiology, symptomatology, and diagnosis of varicocele. Treatment—palliative in early and mild cases. Indications for operation. Technic of excision of the varicose veins. Causes of failure to cure by operation.

This young man is twenty-two years of age. He gives the following history:

For the past year he has had a sense of weakness and dragging down in the back and the scrotum while standing or working unless he wears a supporter. There is also, he states, pain in the penis and along the groin. Sexual neurasthenia and increased sexual excitement are present. The left side of the scrotum has gradually increased in size. He has lost about 15 pounds in weight during the past year..

His past history is negative in so far as the present complaint is concerned; no venereal history.

Physical Examination.—The patient is a well-developed and well-nourished adult male. The head, chest, and abdomen are negative; no adenopathy; no scars about the genitalia.

The left side of the scrotum is enlarged to about the size of a man's fist. This enlargement is due to a mass of dilated veins of the pampiniform plexus, producing what is commonly termed a varicocele.

This condition is frequently met with in young men, but seldom in those of advanced age, except when it has become chronic or is due to malignant disease of the kidney. It usually occurs in individuals with a lax and pendulous scrotum, and is often associated with masturbation, which induces abnormal vascularity of the testis. The fact that it sometimes occurs in quite young boys suggests, however, that there is some congenital condition associated with it. It may also be caused by the pressure of a truss applied for relief of a hernia. As a rule, the varicocele occurs in the left side, and the usual causes assigned for its production there are: first, the left testis usually hangs lower than the right, and consequently the spermatic veins are longer and exposed to greater blood-pressure; second, the left spermatic vein opens into the left renal vein at a right angle, and no valve is present at the orifice; while the right spermatic vein opens obliquely into the vena cava and is valved; third, the presence of the sigmoid flexure on the left side of the body and its distention by accumulated feces as a result of constipation may produce pressure on the left spermatic vein.

A varicocele is characterized by the presence of a soft irregular swelling in the scrotum, somewhat pyramidal in shape, the base below overlapping the testis, and the apex above. It is made up of the dilated and tortuous veins, the outlines of which may frequently be seen through the skin of the scrotum. They impart a sensation to the finger which has been likened to a collection of worms in a bag. Upon pressure the veins are readily emptied, but instantly fill again when the pressure is removed. In mild cases the veins subside to normal dimensions when the patient lies down, but reappear at once when he stands erect. When the varicosities extend into the inguinal canal there is an impulse on coughing. A sensation of weight and pain frequently accompanies a varicocele and sometimes there may be severe neuralgia of the testis. Atrophy of the testis may result from varicocele and seminal emissions are sometimes laid to the same cause.

Treatment.—Slight cases of varicocele are treated by applying a well-fitting suspensory bandage and also instructing the patient to bathe the parts with cold water night and morning, and to use such measures as are necessary to ensure a daily bowel movement.

Surgical treatment of varicocele is indicated in neuralgic cases; in large varicocele where atrophy of the testis is threatening, as in the present case, and in many cases to fit the patient for admission to the public service.

Many of these patients imagine their condition is worse than it is, and they become the prey of various advertising quacks. If they were given the proper advice as to their mode of living, sexual hygiene, and supplied with a proper suspensory early it would be all that would be necessary.

Two methods of surgical treatment of varicocele have been used. The first one, subcutaneous ligation, is mentioned merely that you may know of it. At the present time it has been practically discarded, and I regard it as obsolete. The other method is the open operation and excision of a portion of the veins. This operation, if properly done, gives excellent results.

Operation.—Ether anesthesia. The patient has been prepared in the usual manner. An incision about $1\frac{1}{2}$ to 2 inches in length is made in the upper anterior part of the scrotum through the loose tissues down to the cord. The cord is dissected free by gentle blunt dissection, hooked up with the finger, and drawn out of the incision. The connective tissue forming the sheath of the cord is carefully incised longitudinally, exposing the veins and the other structures that form the cord. The vas deferens, with the loose tissue about it, is isolated so as to preserve the vessels passing with the vas, and held apart. Two main branches of the veins are found in this situation. These are carefully isolated and a catgut ligature is applied to them, high up near the external abdominal ring. The veins are now clamped with a pair of artery forceps below the ligature, and divided between the ligature and the forceps (Fig. 92, 1). In dividing the veins keep about $\frac{1}{4}$ inch from the ligature. This is done in order to allow sufficient tissue to pass a suture through the stump distal to the ligature in order to bring the stumps together.

The lower end of the divided veins grasped by the forceps is stripped downward, so as to free the pampiniform plexus from the other elements of the cord, and the dissection will be carried nearly as far as the epididymis by drawing the testicle up into the wound. The lower end of the veins is now ligated in two parts and divided in the same manner as the upper portion (Fig. 92, 2). By this method practically the entire varicocele is removed. A fine catgut suture is now passed through the two lower stumps, distal to the ligatures, and then through the upper stump in a like manner. When this suture is tied, approximat-

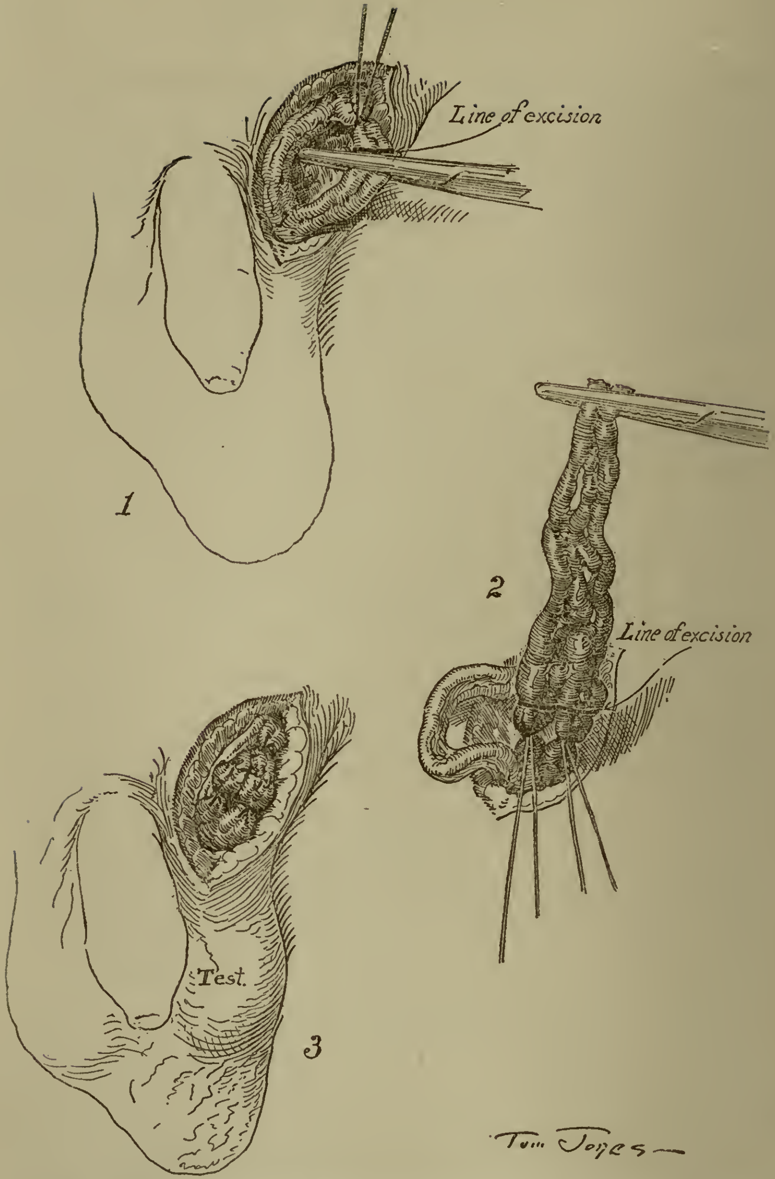

Fig. 92.—1. Veins isolated at external inguinal ring, ligated and clamped, to be severed just above the clamp. 2. Segment of varicocele to be removed, beginning at the upper end, has been dissected free nearly to the testicle and there ligated. The next step will be to cut the veins as indicated at the line of incision. 3. Stump of varicocele united, thus shortening the cord and elevating the testicle.

ing the upper and lower stumps, the cord is thereby shortened and the testicle raised (Fig. 92, 3).

The connective-tissue sheath will also be shortened by suturing it with fine catgut. The wound in the scrotum is now closed with a few interrupted silkworm-gut sutures. Before tying the silkworm-gut sutures always be sure that there is no bleeding, thereby avoiding troublesome hematoma, which will surely form if there is any hemorrhage. The usual dressings are now applied in such a manner as to support the scrotum.

The patient will be kept in bed for about ten days to two weeks to allow organization and a firm cicatrix to form between the divided ends of the veins. This method of exposing the veins high up is much better than that in which the incision is made lower down in the scrotum. It is much easier to dissect the veins out from above, where only one or two trunks exist.

This operation results almost uniformly in cure. The failures are due to the ligatures not including all the varicose veins. The slipping of the ligatures down over the stumps, resulting in secondary hemorrhage and great difficulty in securing the veins which may have retracted up into the inguinal canal or down into the scrotum. Accidents of this kind may result in very extensive loss of blood and require secondary operation under general anesthesia in order to find and secure the bleeding vessels. Injury to the vas may occur. Ligature of both arteries to the testis may result in necrosis.

SEPTIC GALL-BLADDER WITH SPONTANEOUS CHOLECYSTENTEROSTOMY

Summary: A patient, ill four weeks, presenting symptoms of septic gall-bladder, peritonitis, and intestinal obstruction. Operation—gall-bladder found adherent to transverse colon with large calculus occluding a communication between gall-bladder and colon at site of adhesions.

The history obtained in this case is given by the son of the patient, the patient being in no condition to give a satisfactory history. He states that his mother is sixty-two years of age, and that her illness began four weeks ago. At first there were severe pains in the abdomen, more on the right side. The pains were intermittent, lasting about ten minutes at a time, and recurring about every hour. There was nausea and vomiting. For the past four days the pain has been continuous and increased in severity. The vomiting has persisted and for the past forty-eight hours she has been unable to retain anything in her stomach. The vomitus has a very foul odor, fecal in character. There has been no bowel movement for the past four days, and previous to that time, he says, they were unable to cause the bowels to move except very slightly.

The son states further that his mother has had stomach trouble for many years, at times having attacks of cramps and vomiting spells. The bowels were always constipated. She is the mother of 6 children, all living and well. There is nothing further that we can obtain in the history of this patient except that she has been attended by a physician during this four weeks' illness, and that two days ago a second physician, who had treated the patient some years previously, was called in attendance. He immediately advised surgical measures as the only hope for relief, and the patient was transported 400 miles to Chicago, arriving here about two hours ago.

Upon examination the patient is found to be in a very serious condition. The pulse is 120, weak and small; temperature 97°

F.; respirations 34. There is persistent vomiting of a fecal character. The abdomen is distended. The blood count shows leukocytes per cubic millimeter, 17,720; erythrocytes per cubic millimeter, 4,750,900; hemoglobin, 65 per cent.

Urinalysis.—Specific gravity, 1022; reaction, acid; albumin, good trace; few hyaline casts; many white blood-cells.

Since the patient's arrival in the hospital she has received stimulation and has been prepared, as best she could be under existing conditions, for operation.

Certainly this is not a very promising case—a true surgical emergency in a very poor surgical risk. The family appreciate the condition, having been so advised by the last physician, and they desire that we do the best that we can.

The tentative diagnosis is: Ruptured septic gall-bladder, peritonitis, and intestinal obstruction.

Operation.—Ether anesthesia. Believing that we have a ruptured gall-bladder to deal with, a vertical incision about 3 inches in length is made through the outer third of the right rectus, beginning about 1 inch below the margin of the ribs. Upon opening the peritoneum the various structures are found to be matted together by very extensive adhesions. The omentum is adherent to the anterior surface of the liver. The gall-bladder cannot be seen. There is evidence of quite diffuse peritonitis. An attempt will be made to separate the omentum from the anterior surface of the liver and thereby expose the gall-bladder. A couple of laparotomy pads are used as packing to wall off the surrounding area for fear there may be an escape of some infective material.

With the finger covered by gauze a gentle separation is started in the line of cleavage between the anterior surface of the liver and the omentum. As this is separated the fundus of the gall-bladder is exposed and a large stone is felt beneath the finger. The wall of the gall-bladder at this point is very thin, the stone having practically passed through the gall-bladder wall and being held in this position by the adherent omentum. The surrounding area having been well protected by pads, the stone is removed and there escapes a quantity of foul-smelling pus.

There are two more stones of similar size (about the size of a hickory nut) and they are removed. Following their removal there escapes a large quantity of purulent material, having a distinct fecal odor. This cavity is quite large, and it would be impossible under the circumstances to isolate the gall-bladder and remove it. It would be unwise to break up these adhesions at this time, and there is no doubt in my mind but the cavity of the gall-bladder communicates with the transverse colon. No doubt as a result of pressure necrosis produced by the stones in the gall-bladder a communication has been established with the transverse colon. Under these conditions the proper procedure will be to establish free drainage and close the wound.

Two fair-sized rubber tubes are introduced down to the bottom of the cavity. A couple of strips of gauze are placed alongside of the tubes, the external wound closed in the usual manner, and a large dressing applied.

The patient's condition now is as good as when the operation was started, but it is not such as to make any extensive operative procedure permissible. Any further surgery that the case may demand can be done at a more opportune time. The patient will be returned to her bed, external heat applied, and such stimulants as are necessary will be given. Her condition is fair; she has withstood the operation very nicely, and our efforts will now be to overcome operative shock, if any develops.

As to the prognosis, this must be guarded. You must consider the patient's age, the length of time she has been sick, the degree of sepsis, and her general condition previous to operation.

CLINIC OF DR. CARL B. DAVIS

Presbyterian Hospital

CERVICAL RIB

Summary: Demonstration of cases illustrating the cervical rib syndrome. Discussion of symptomatology, surgical pathology, diagnosis, and treatment.

The first patient whom I present was operated on three years ago. Her clinical history reads as follows:

Miss A. H., age twenty-five. Telephone operator. The patient is conscious of distress in the neck and left shoulder. As long as she can remember the use of her left arm has increased the discomfort. During childhood she was frequently punished for standing with her shoulder drooping. Pain has never radiated into the arm. Recently the pain has been so severe that she performed her switchboard work with considerable difficulty.

Examination shows a slender young woman with normal physical findings except that in the left side of the neck a fixed, hard, longitudinal mass is found on deep palpation. The patient stands with a droop of the left shoulder. She is able to straighten up, but this causes discomfort in the left side of the neck. There are no vascular, motor, or sensory changes in the arms. *x*-Ray plates show a cervical rib of the first degree on the left side (Fig. 93).

Under ether anesthesia the rib was readily removed, using the technic which I shall describe in a moment. The patient made an uneventful convalescence, receiving no sedative at any time. She returned to her former occupation without distress.

Our second patient is a housewife, aged thirty-six years. For the two years preceding her first appearance in this clinic

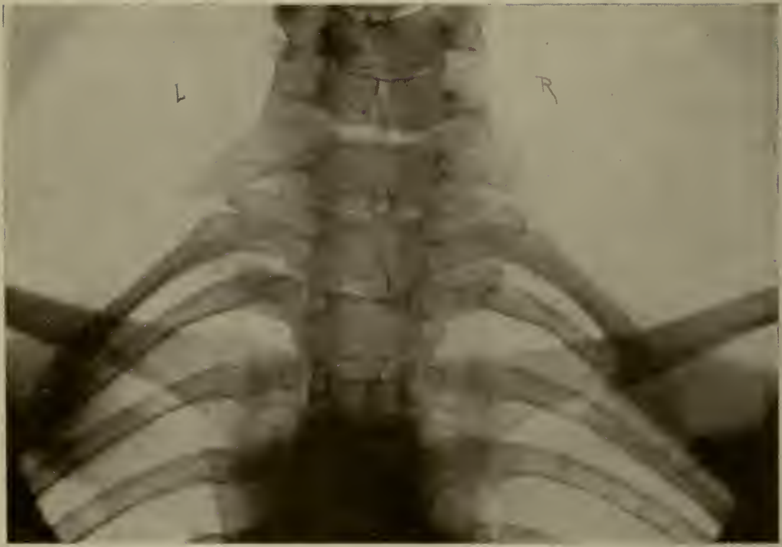

Fig. 93.—Roentgenogram in case of Miss A. H., a switchboard operator, who was compelled to give up work because of pain in the left shoulder and side of neck. Note cervical rib on left side.

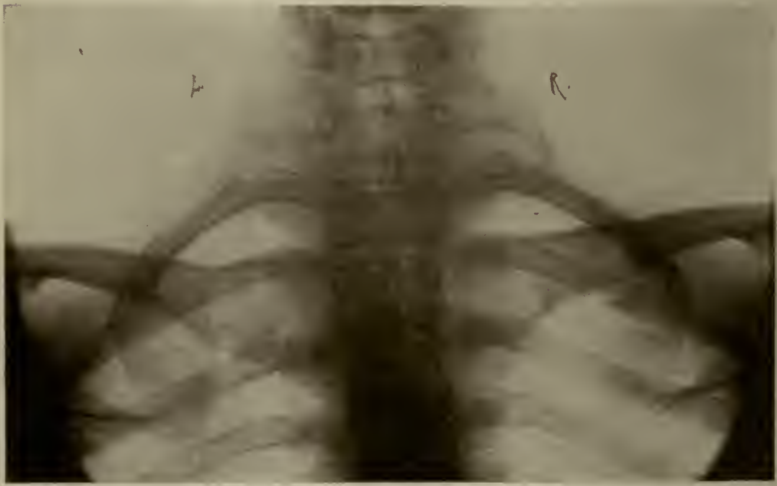

Fig. 94.—Roentgenogram showing bilateral cervical rib of first degree. Symptoms more distressing on the side of the right or shorter rib. Right rib removed. Left rib not operated on.

she complained of increasing discomfort extending from the neck into the arms. The arms tired more readily than formerly. There was pain in the right arm, and discomfort in the left arm after attempting the usual household tasks. The inconvenience became so marked that the patient attempted very little. The discomfort did not extend to the fingers. There was no atrophy of the intrinsic muscles of the hand. There were no vasular, motor or sensory changes in the hands or arms. Physical findings were normal otherwise. *x*-Ray showed bilateral ribs of the first degree (Fig. 94). The left rib was the longer.

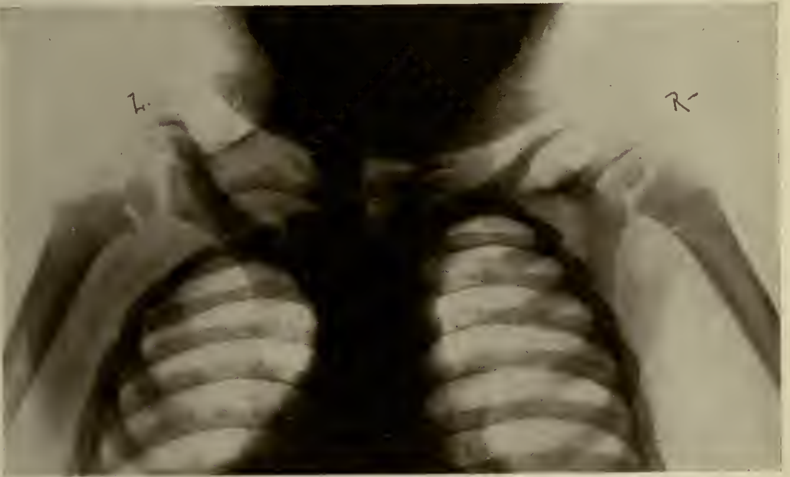

Fig. 95.—Roentgenogram of Master A. T. Note well-developed cervical rib of the first degree on the left side.

The right rib was removed. The patient suffered rather severely for one week following operation. Two months following operation the pain was entirely gone.

I have here the case histories of 5 other patients whom I have operated on for this condition, and in order to give you a better conception of the various phases of the cervical rib syndrome I shall read a brief outline of each case, with remarks on its salient features.

Case III.—A. T., four years of age. Patient does not raise left arm above the horizontal. The arm can be raised through normal range by passive motion. The child protests when urged to elevate hand above the head. Mother noticed a mass in the left side of the root of the neck during infancy. x-Ray examination showed a long rib extending downward and forward (Fig. 95). The rib was outlined readily by palpation. The rib was removed with some difficulty due to the smallness of the structures. One year after operation a verbal report stated that the child was raising the hand aloft in a normal manner.

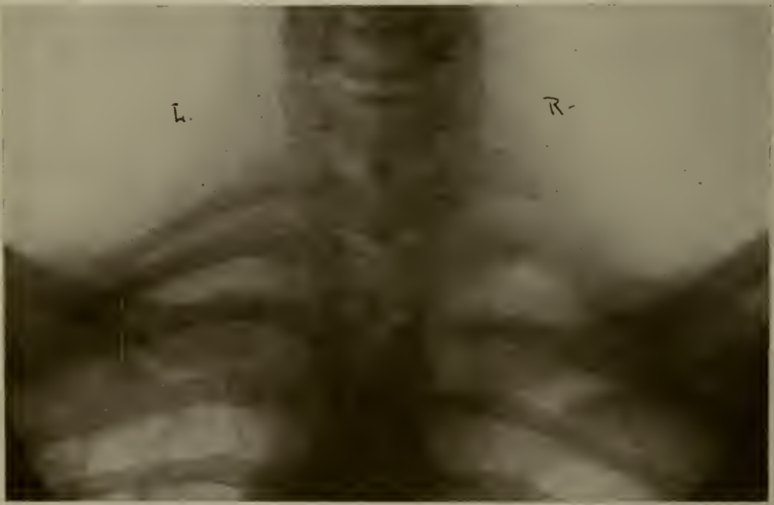

Fig. 96.—Roentgenogram in case of Miss A. V. The plate was made after operation and shows defect following resection of a portion of the shaft of the first rib. In this case the pain was greater on the side of the short cervical rib which was not removed.

Case IV.—Miss A. V., age nineteen. Switchboard operator. For a year before entering the hospital the patient gave symptoms suggestive of hyperthyroidism. There is a record of rapid heart, nervousness, and tremor. Four months previous to admission to hospital patient noticed pain in the right side of the neck and the right arm. A swelling in the right side of the root of the neck was noticed by the patient. A slight enlargement of the right lobe of the thyroid was evident. The distress in the neck and arm became more severe and more constant. If she gave up her work at the switchboard the pain diminished, but returned each time she took up her work again. Examination showed slight symptoms of hyperthyroidism, enlargement of the right lobe of the thyroid, and a resistance in the right side of the neck suggestive of a cervical rib. An *x*-ray plate showed bilateral cervical ribs with the larger rib on the right side (Fig. 96). Under general anesthesia the first rib was resected and the artery and brachial plexus were dropped into the defect. This was done with the idea of avoiding traumatism of the plexus, which had resulted when the plexus had been pulled on too severely in a previous case. The symptoms were relieved by this technic. The pleura was opened while the rib was being isolated previous to removal. No serious results followed. The patient has been under observation for six years following operation. There has been no recurrence of pain in the arm or neck. The symptoms of hyperthyroidism have gradually disappeared.

CASE V.—Miss H. M., age twenty-three. Two years before admission to the hospital the patient first noticed dull, intermittent distress in the left side of the neck, in the left shoulder, and arm. The discomfort would disappear for two or three weeks at a time. In the last ten months the pain has been continuous and of increasing intensity. In the last few months the patient has noticed a gradual failure of the grip in the left hand. Only by increased effort could she retain an object in the hand. There was no complete paralysis present. History and physical findings were otherwise negative. Under general anesthesia the subclavian artery, brachial plexus, and seventh cervical transverse process were exposed. The tip of the transverse process was removed (Fig. 97) and also a mass of connective-tissue bands extending from the process to the first rib. The connective-tissue bands passing under the brachial plexus were apparently a part of or associated with the scalenus medius muscle. To carry out the procedure the brachial plexus was displaced forward and backward several times. Following the operation the patient suffered greatly—morphin was necessary. There was the usual area of anesthesia on the shoulder down to the beginning of the circumflex distribution in the upper arm. There was a moderate degree of hyperesthesia in the distribution of the musculocutaneous and internal cutaneous nerves. Tactile and pain sense were otherwise normal throughout the arm and hand.

Motor function was greatly disturbed after operation. Ulnar motion was lost. There was inability to adduct and abduct the fingers—ulnar motion of the thumb was gone. The flexor carpi ulnaris was functionless. The musculospiral was involved, as there was almost complete wrist-drop and absence of extension of the fingers. The median motor function was about the same as previous to operation. The patient was in the hospital five weeks. The pain had disappeared and ulnar and musculospiral motor function were returning upon dismissal. The paralysis was doubtless due to stretching of the plexus. This patient returned in two years with the same condition on the right side. The same treatment was used. There were no postoperative complications as before. The patient, three years after the second operation, reports herself in normal condition.

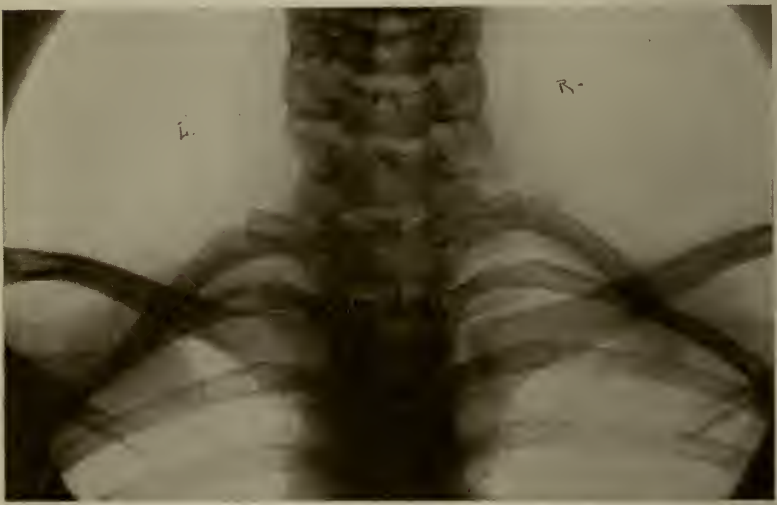

Fig. 97.—Roentgenogram in the case of Miss H. M. The plate was made after the left transverse process had been removed.

Case VI.—Miss T. V., age thirty-four. Dressmaker. For some months the patient has had increasing pain in the left side of the neck and in the left shoulder and arm. This is present most of the time. Earlier there was an intermittent discomfort in the same region. Examination showed a bone-like mass in the base of the neck on the left side. In front of the mass there was a distinct pulsation—a greater force than is customary in this region. A thrill was present. There was a marked lessening of power in the left arm. There was dilatation of the pupil on the same side as the tumor. Blood-pressure: systolic, right arm, 116; left arm, 106; diastolic equal on both sides. Physical examination showed normal findings otherwise. *x*-Ray examination showed a cervical rib of the second degree (Fig. 98). At operation the bony portion of the rib extended to within 1 inch of the thoracic rib. The anastomosis was completed by a section of cartilage curving back in such a manner that a recess was formed in which lay the subclavian artery. The rib was removed in the

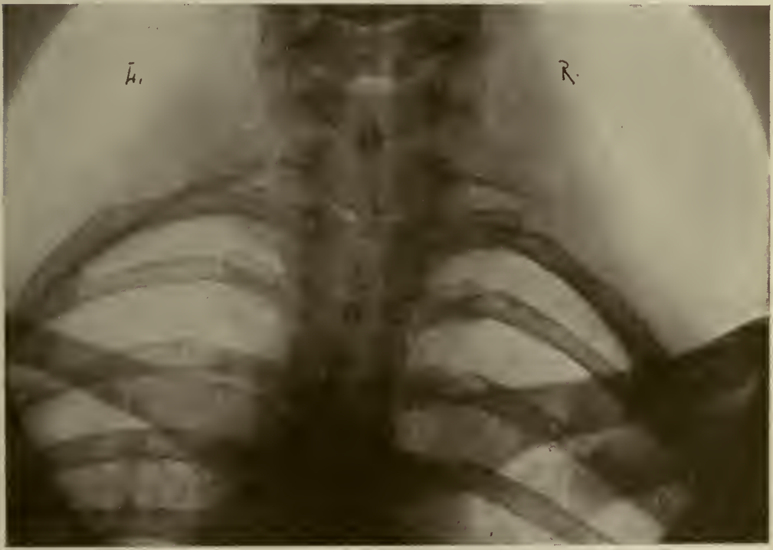

Fig. 98.—Roentgenogram in the case of Miss T. V. The symptoms were on the side of the left or larger rib.

usual manner. There was increased weakness in the arm and hand for several weeks after operation, but no pain. One year after operation the arm and hand were normal and the pupils were equal. This patient had been advised that an aneurysm of the subclavian artery was the cause of her discomfort.

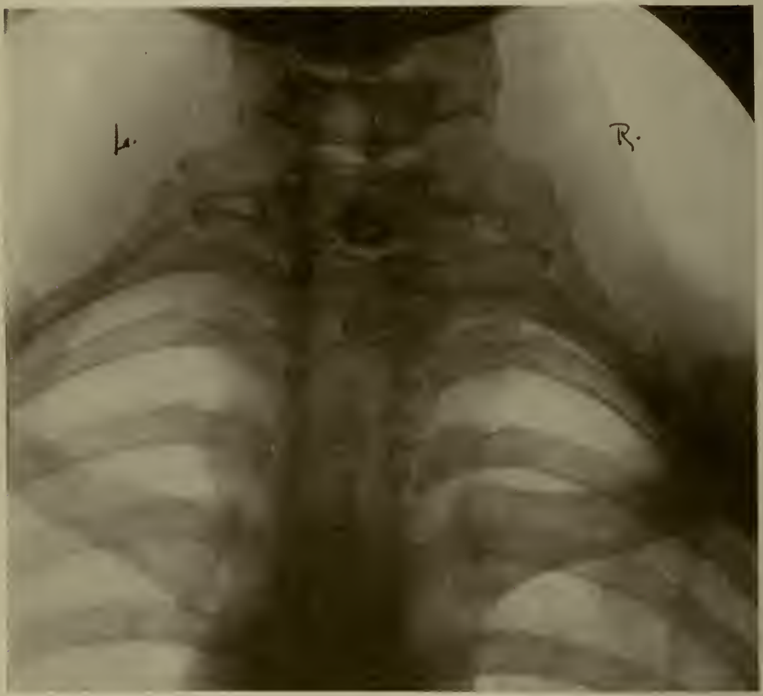

Fig. 99.—Roentgenogram in the case of Mrs. M. D. Cervical ribs of the second degree in pseudo-articulation with the first thoracic ribs. The symptoms were on the side of the right or shorter rib.

Case VII.—Mrs. M. D., age twenty-seven. Housewife. Present complaint: Discomfort in right shoulder and right side of neck. Swelling in side of neck. Patient states that six years ago a swelling was found in the right side of her neck. In the last year she has noticed a discomfort when pushing with her right arm or when lifting or reaching above her head. The right hand and arm are more troublesome in cold weather than in warm.

Physical examination shows normal findings throughout, except for the condition in the neck. When the head is thrown backward there are swellings in the neck 1 inch above the midportion of the clavicles. On the right side the mass is somewhat painful on pressure, and there is a distinct thrill in the pulsating vessel passing in front of it. Back of the pulsating area a rounded cord passes diagonally downward and laterally over the mass. Pressure on this cord causes pain in the arm and hand. *x*-Ray examination shows bilateral cervical ribs (Fig. 99). On the left side there is a long, straight rib, the distal end of which is lost in the shadow of the first thoracic rib. On the right side is a somewhat shorter rib which drops from the seventh cervical transverse process to the middle of the first thoracic rib articulating with a tubercle-like protrusion. Under general anesthesia the right rib was removed in the usual manner. The rib was 1½ inches long and had the structures of a true rib. The distal end of the cervical rib was slightly movable on the first thoracic rib. The end of the cervical rib was cartilaginous. It was attached to the thoracic rib by firm connective-tissue bands. The patient was entirely free from pain on leaving the hospital. She received no sedative during convalescence.

DISCUSSION

Medical literature for two hundred years records the presence of neck or cervical ribs. In the last fifty years more accurate clinical records have been made. With more accurate diagnosis, made possible by the *x*-ray, there has been a greater knowledge of the variation in symptoms. Early cases were recognized only where symptoms or findings were pronounced and characteristic. Now, with the earliest onset of symptoms, the Roentgen plate is used to verify the presence of an accessory rib.

Certain lower forms of animal life normally have cervical ribs. The presence of this type of rib in the human is explained by some on the basis of atavism. The seven cervical vertebræ differ from the first thoracic vertebra in that the cervical transverse process possesses an opening known as the foramen transversarium for transmission of the vertebral artery and vein. The anterior portion of the process known as the anterior root is described as the costal process at times. This costal process arises by a separate center of ossification in the seventh cervical vertebra, and occasionally in the fourth, fifth, and sixth cervical vertebræ (Figs. 100–102). With the growth and prolongation of the costal process, which is really a fused rudimentary rib,

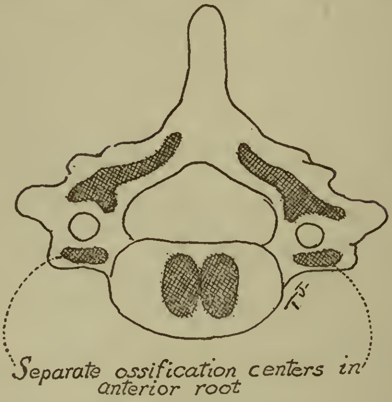

Fig. 100 (Diagrammatic).—The transverse process of the seventh cervical vertebra shows two centers of ossification instead of the one found in the first thoracic transverse process. One of these centers forms the anterior root of the transverse process, which is, in reality, a fused rudimentary rib.

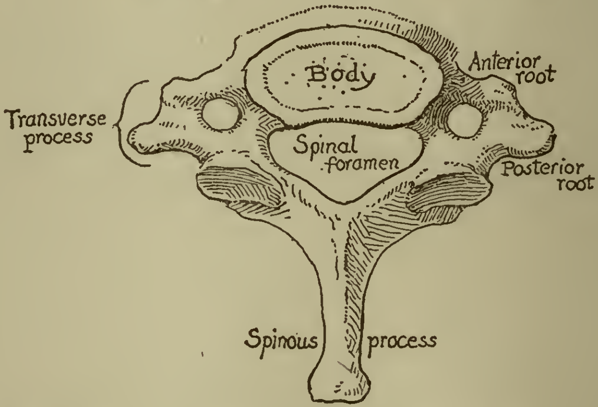

Fig. 101.—Sketch of seventh cervical vertebra as seen from above. The anterior root of the transverse process is, in reality, a fused rudimentary rib.

there results a supernumerary or cervical rib. The transverse process of a thoracic vertebra has but one center of ossification corresponding to that in the posterior root of the transverse process of the seventh cervical.

Cervical ribs have been divided into false and true ribs. The latter have a shaft, neck, and head, and articulate in the manner usual to the thoracic ribs. False cervical ribs consist of a shaft merely, and articulate with the tip of the transverse process only.

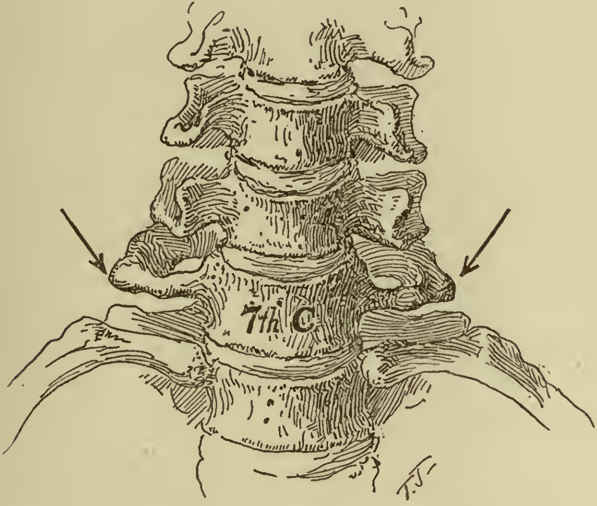

Fig. 102.—Sketch illustrating relative prominence of transverse process of seventh cervical and neighboring vertebræ. The tubercle of the seventh transverse process (see arrow) is a convenient landmark in the neck. In case one comes down on the sixth transverse process (carotid tubercle) rather than on the seventh, the former is readily recognized by the fact that the edges fold up and form a deep groove, while the transverse process of the seventh flattens out.

Four groups of cervical ribs have been described by Gruber. The first extends out into the neck with the distal end free (Fig. 103, 1); the second group articulates with the shaft of the first thoracic rib (Fig. 103, 2); while the third is attached to the sternum with a cartilage common to it and the first thoracic rib (Fig. 103, 3); the fourth type is attached to the sternum by its own distinct cartilage (Fig. 103, 4). The majority

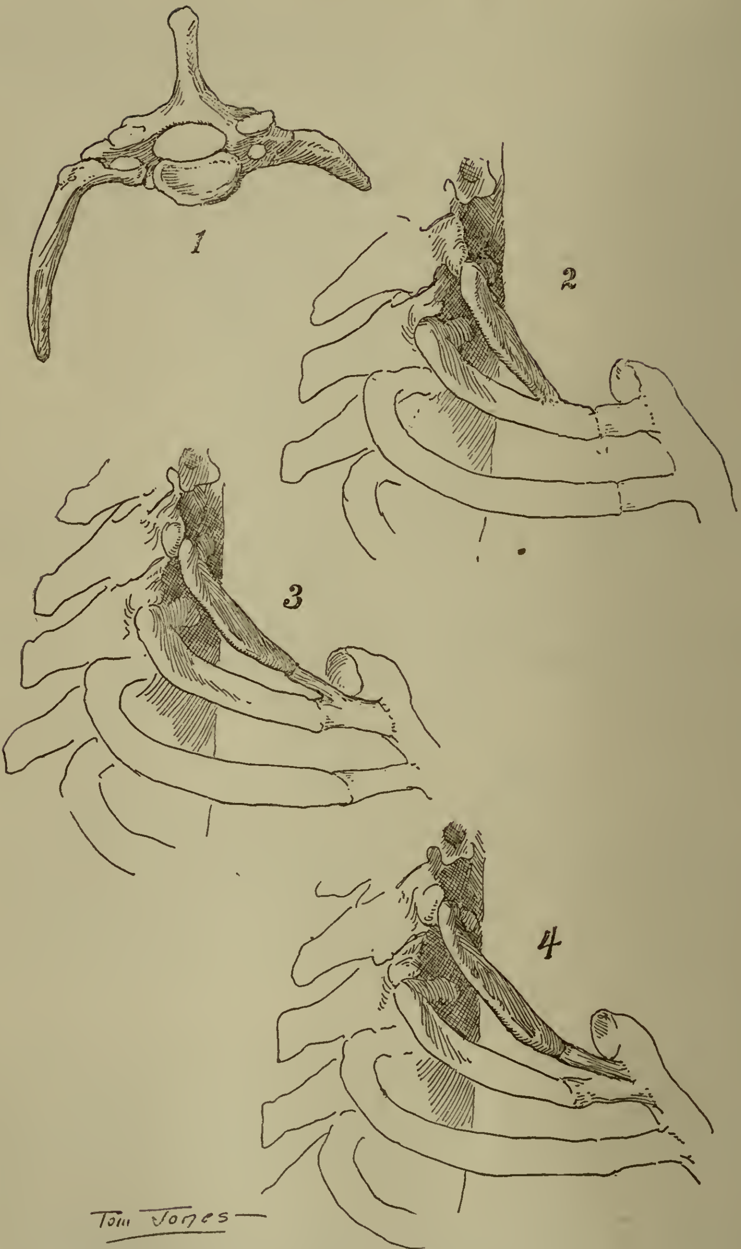

Fig. 103.—Sketch illustrating the four degrees of cervical rib (see text).

of cervical ribs belong to groups one and two, but of these the second group is more common. The attachment to the first rib is most varied. It may consist of a fibrous band, a cartilaginous attachment, or a combination of the two, quite suggestive of a joint, and finally, bony synostosis is seen. Early English anatomists have described the distal end of the rib as above, and, in addition, have reported cases in which the rib itself has consisted of irregular groupings of bone, cartilage, and fibrous tissue suggesting an incomplete embryologic development.

Approximately 1 per cent. of the dissecting material in anatomic laboratories shows some form of cervical rib. Judging from the clinical aspect very few of these ribs cause enough disturbance to suggest their presence. The literature shows that these ribs are found more frequently in women than in men, more frequently bilateral than unilateral, and when unilateral, more frequently on the left side than on the right side. When two ribs are present the left is more frequently the larger. Symptoms seem to be present about as often on the side of the smaller rib as on that of the larger one.

The symptomatology and findings are grouped under three headings:

(*a*) The presence of a visible or palpable tumor in the neck.
(*b*) Vascular phenomena.
(*c*) Nervous disturbances: sensory, motor.

The tumor in the neck is seldom visible; at times it is as large as a walnut. One case had been diagnosed as osteoma of the first rib because of the marked elevation of the mass. Palpation of the shaft or end of the rib is quite simple in some cases, while at times it is impossible to determine whether it is a cervical or thoracic rib.

The vascular symptoms are usually referable to the arterial supply, as might well be imagined from the relations of the rib, vessels, and scalene muscles (Fig. 104). You will recall that the relation of the structures involved from before backward are the subclavian vein, anterior scalene muscle, subclavian artery, and brachial plexus. These structures are never under a seventh cervical rib. A simple form of disturbance is that caused by the artery passing over the cervical rib, or, what is more common, passing in front of the end of the rib in such a manner that a thrill is present, so that sometimes the mistaken diagnosis of aneurysm is made. The thrill was quite prominent in two of our cases.

Narrowing of the lumen of the artery has resulted in diminution or loss of the radial pulse on the affected side. Several patients have observed that there is more distress in the winter than in warm weather. Holding the hands and arms in cold water often causes greater discomfort and blanching of the skin on the affected side. This temporary ischemia is sometimes made use of as diagnostic aid. Both hands are plunged into cold water and then held aloft. The pallor disappears more

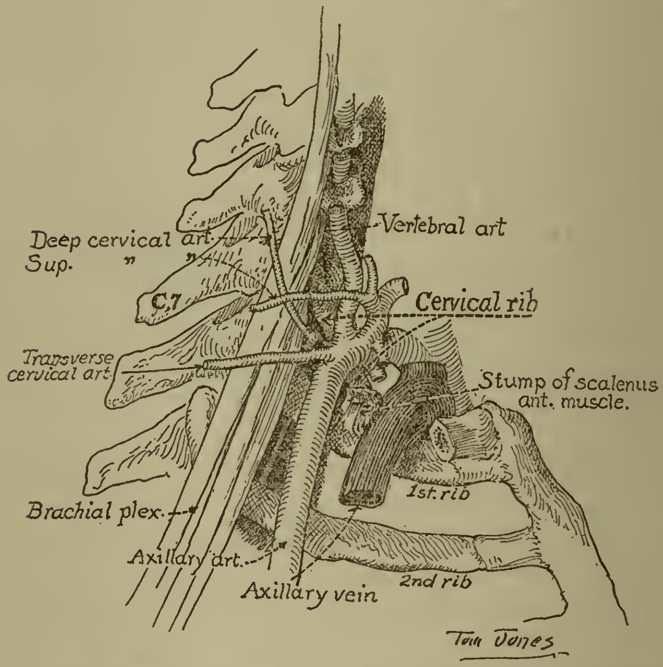

Fig. 104.—Sketch showing the deep surgical anatomy of cervical rib. The brachial plexus has been pulled backward to give a better view. A rib of the first degree frequently remains proximal to the artery.

slowly from the side in trouble. Some patients wrap the arm in special covering to avoid the discomfort that results if the arm is accidentally left uncovered. One patient who worked in an ice-cream factory found that he could not handle the cracked ice with the hand that was on the side of the disturbing rib. Gangrene is reported from complete loss of blood-supply due to thrombosis following pressure. Aneurysm of the subclavian has resulted from injury to the artery at the point of contact with the rib. The onset of arterial disturbance is so gradual that collateral circulation usually develops before serious vascular failure results.

Disturbances on the side of the nervous system are more frequent than those of the circulatory system. These disturbances may be purely sensory, but are frequently associated with motor changes. Very rarely are the symptoms purely motor. The greater frequency of nervous symptoms is, of course, due to the relative position of the brachial plexus and artery. A short cervical rib of the first degree might press upon the plexus and not reach far enough downward and forward to disturb the artery.

The nervous symptoms, rarely occurring before adolescence, are most frequently seen between the ages of twenty and forty years. Use of the arm is the most frequent cause of the appearance of nervous symptoms. Carrying a heavy weight with the arm at the side is a frequent cause of disturbance. This is due to traction on the plexus over or against the end of the rib. Working with the arm in an extended or elevated position will cause symptoms in some cases. One patient, an operator of a telephone switchboard, could not continue work because of the pain caused by stretching out the arm in an effort to complete connections.

Another patient, a professional pianist, found that prolonged practice caused weakness and pain in the arms.

The symptoms referable to the nervous system may be slow or rapid in onset, varying from months to years. They vary greatly in intensity, increasing, diminishing, and disappearing at intervals. The sensory symptoms vary from slight paresthesia to the most intense pain. Anesthesia or hypesthesia are not common.

The motor or muscular changes are not so common as the sensory. The arm tires more readily than normally. The power in various muscle groups is diminished. Atrophy is not uncommon. Complete paralysis is seen, but is very rare. The motor changes are seen most frequently in areas supplied by nerve-fibers from the eighth cervical and first thoracic roots. Various symptoms referable to the sympathetic system are described. In our series but one patient showed sympathetic disturbances. These were dilatation of the pupil on the same side as the disturbing rib and hoarseness when the patient was tired. These disappeared some months after operation.

Dr. Joseph Miller has called attention to the fact that in some cases there is a definite picture of cervical rib disturbance, but no rib is seen in the *x*-ray picture. He has suggested that if these symptoms persist for a year or longer, and do not respond to general treatment, it is advisable to do an exploratory operation. At times a short rib is found, the shadow of which has been superimposed upon the shadow of the transverse process of the seventh cervical vertebra. At times a tendinous band may extend from a short rib or from the seventh transverse process to the first thoracic rib. Within this tendinous band islands of cartilage may be found suggestive of an undeveloped anlage of a cervical rib. The brachial plexus may be stretched over this tendinous band in such a manner as to give symptoms. Acting on this suggestion, complete relief was obtained in a patient who showed unilateral symptoms but no cervical rib on *x*-ray examination. The patient went through a very painful convalescence of two months' duration. A year later symptoms developed on the opposite side. Because of the unpleasant convalescence the patient endured the discomfort for one year before reporting for operation. Again no rib could be found by *x*-ray examination. A number of connective-tissue bands suggestive of strong fascia were removed, and the patient obtained complete relief.

Operation.—Two methods of approach have been suggested.

By the first method an incision through the muscles of the back down to and at right angles to the transverse processes of the seventh cervical and first thoracic vertebræ is used. The accessory rib is exposed and removed after severing the seventh transverse process. This procedure is far more difficult and seems more dangerous than the anterior route. An easier exposure is given by an angular or curved 3-inch incision the lower half of which is parallel to and $\frac{1}{2}$ inch above the clavicle, the upper half extending upward and parallel to the anterior border of the trapezius (Fig. 105). The platysma and fascial layers are opened and the vessels and plexus exposed. When ribs of the first and second degree are concerned it is not necessary to carry the dissection forward enough to expose the subclavian vein which lies anterior to the scalenus anticus muscle. A rib of the second degree not infrequently carries the subclavian

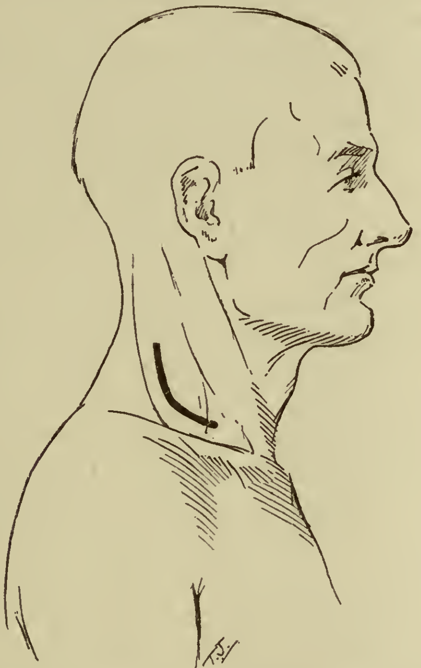

Fig. 105.—Incision for removal of cervical rib.

artery upward in an exaggeration of its normal arc. In these cases one feels more comfortable with the scalene muscle exposed. The phrenic nerve is seen on the front of the scalenus anticus, but is well out of the field. The brachial plexus passing over or in front of the tip of the rib is usually in such a position that it is necessary to swing it forward and backward to free the rib for removal. As little displacement as possible of the plexus is advisable, as pain and transient paralysis of varying degree result from too free manipulation of the nerve trunks.

In one case flattening of the muscles of the back of the scapula and interference with the function of the arm resulted from accidental injury to the suprascapular nerve. This nerve lies high in the operative field and should not be exposed as a rule. The upper angle of the wound may expose the spinal accessory nerve as it enters the trapezius muscle. The periosteum must be removed with the rib, as the literature reports re-formation of bone from periosteum that has been left in place. Removal of the shaft is usually sufficient to relieve symptoms. Removal of the neck of the rib increases the difficulty of the operation greatly, and frequently gives rise to severe hemorrhage.

In one instance we resected the first thoracic rib and dropped the plexus and subclavian artery into the defect to avoid the pressure of the cervical rib (Fig. 96). This resulted in complete relief. This technic does not seem advisable, however, as the pleura is readily opened either by an instrument or by a bone fragment. The pleural cavity was opened accidentally in the one case in which the first rib was resected. The dangers associated with opening the pleura seemed greater than the stretching of the plexus, and for this reason I have not repeated the procedure.

Following operation there is, in some cases, anesthesia of the skin over the shoulder in the region between the incision and the area in the upper arm supplied by the circumflex nerve. This may be avoided by saving the branches of the cervical plexus as they pass across the field of operation. This anesthesia disappears in a few months.

CLINIC OF DR. LEIGH F. WATSON

Rush Medical College

LOCAL ANESTHESIA FOR INGUINAL HERNIOTOMY

Summary: Inguinal herniotomy from the standpoint of the technic of local anesthesia. Detailed account of the preparation of solutions, the choice of needles, the preparation of the patient, and the progress of the anesthesia during the various steps of the operation.

Today we shall take up the operation for hernia from the standpoint of the local anesthetist. I shall show you how we get ready for an operation under local anesthesia, the solutions we use, the needles that are best, and shall operate on a patient who has a double oblique inguinal hernia.

I want to give you a very brief sketch of the progress that has been made with local anesthesia during the last thirty-five years. The development of the modern technic probably dates back to Koller's spectacular demonstration of cocain anesthesia of the cornea before the Ophthalmological Congress in 1884. Within a few months cocain anesthesia was tried in a variety of operations by surgeons throughout the world, among whom were the American pioneers, Hepburn, Hall, Halsted, and Corning. Halsted very early recognized the importance of intradermal infiltration for skin anesthesia instead of the generally used hypodermal method.

On account of the strong solutions employed by these early investigators toxic symptoms often resulted and sometimes death occurred. As early as 1884 Reclus urged the use of solutions no stronger than 1 per cent., and Corning demonstrated that complete anesthesia followed the injection of $\frac{1}{3}$ of 1 per cent. solution. In 1887 Schleich used $\frac{1}{5}$ of 1 per cent. and even $\frac{1}{10}$ of 1 per cent. satisfactorily, and a few years later he reported that 90 per cent. of his operations were being done under local anesthesia.

By 1887 a large number of herniotomies had been attempted by surgeons in widely separated localities, with more or less success. The general method was to infiltrate all tissues in the field of operation. Cushing in 1897 advocated exposing the nerves supplying the hernial region and directly blocking them. This was the most important advance in the technic of cocain anesthesia since the introduction of the diluted solutions by Reclus and Schleich. In 1899 Cushing reported 49 operations for non-strangulated hernia done by Halsted, Bloodgood, and himself. Fourteen of these patients were over sixty years of age, the oldest being eighty-four. Bevan also did 50 or more hernias, and continues to recommend local anesthesia in quite a proportion of cases, urging it almost without exception in the strangulated type. About this time Wyeth and Bodine began using cocain in $\frac{1}{5}$ of 1 per cent. for skin and nerve trunks, and $\frac{1}{10}$ of 1 per cent. elsewhere. In 1917 Bodine estimated that they had performed over 3000 herniotomies without a fatality, and with as high a percentage of permanent cures as follows general narcosis.

With the advent of novocain in 1905, and more recently apothesin, non-toxic substitutes, the dangers of poisoning from the anesthetic have been practically eliminated, and the development of the details in technic have enabled us to use local anesthesia wherever the whole field of operation can be anesthetized. Patients have been educated into believing that they must be asleep during a major operation, that consciousness is synonymous with pain. However, we find that many individuals welcome the opportunity of avoiding a general anesthetic when they are assured of a painless local operation; they are most appreciative of good work, and our records show that each year we are doing an increasing number of major operations under local anesthesia.

When shall we use local anesthesia in hernia? Assuming that the patient is an ordinarily good surgical risk and that he has had the general facts explained to him, he certainly has a right to select his own anesthetic. It is always a mistake to urge local, when for any reason the patient prefers to be asleep. Local anesthesia is usually contraindicated in highly nervous subjects and in children, although I have frequently operated on patients from nine to twelve years of age with very happy results. The confidence of any patient must be secured early and maintained throughout the operation. The surgeon must not become so engrossed in his work that he neglects for an instant the primary consideration—the comfort of his patient—who has been assured that the operation "will not hurt." Local anesthesia is successful only when it is painless.

The local method for herniotomy adds greatly to the comfort of the young and robust, and in the presence of old age, shock, hemorrhage, strangulation, pulmonic, nephritic or cardiac lesions, I usually insist upon it. Reclus says the hernia operation is the triumph of local anesthesia.

Anesthetic Solutions.—Now we will discontinue this general discussion and prepare the solutions for our patient, who is a middle-aged man with a reasonably large right hernia, and a small one on the left side. We will do one operation under procain (American novocain) and the other with apothesin. Both drugs can be purchased in tablet form, and I use either in a strength of $\frac{1}{2}$ of 1 per cent. solution. As you know, these drugs are comparatively non-toxic in ordinary amounts and are probably safe if you do not inject more than 8 to 10 grains distributed over the period of an hour. For the first operation we will use procain (novocain) $\frac{1}{2}$ of 1 per cent. solution. I have had the nurse boil a test-tube and a couple of 1-ounce medicine glasses. No one is allowed to touch the tablet. We remove the cork and shake a 4.8 grain tablet out on a piece of sterile gauze and then into the test-tube. I now take a sterile medicine-dropper and add 10 minims of adrenalin chlorid solution (1 : 1000) to the tablet in the test-tube, and half fill the tube with sterile normal salt solution, and boil over a flame for three minutes. We pour half of the contents of the test-tube into one of the medicine glasses, the remaining half into the other glass, and we add enough normal salt solution to make 1 ounce of anesthetic in each glass.

With each glass containing 2.4 grains of anesthetic it is easy to estimate at any time during the operation just how much has been used. I want to call attention to the importance of dissolving the anesthetic tablet in normal salt or Ringer's solution if you expect to secure the best results. We will come back to this point later on, because there are some things I want to emphasize.

We will now mix the $\frac{1}{2}$ of 1 per cent. apothesin for the second operation. It is prepared the same way as the procain (novocain) solution. In using apothesin, remember, it is precipitated by sodium bicarbonate and alkali, and if the test-tube, medicine-glasses, syringes, and needles are boiled in sodium bicarbonate or alkali before using, they must be rinsed out with plain sterile water or normal salt solution.

Syringes and Needles.—The selection of a suitable syringe depends largely upon the preference of the operator. Bodine always used a 2-dram glass syringe. The massive infiltration apparatus of Matas and Farr's pneumatic injector are valuable aids when a large field is to be infiltrated. For the patient we are about to operate on I will use a 12-c.c. all metal syringe. This type of syringe is always ready, never gets out of order or breaks, and it takes a slip needle. A hernia of this size usually requires about 40 to 60 c.c. of anesthetic solution, and we will use two syringes, so one will always be ready.

We will select two sizes of needles. This very fine one (No. 24) we will use only for the first injection of the skin and blocking the nerve trunks. For the succeeding injections we will take a needle somewhat larger (No. 20) with a strong shoulder. With this we can work rapidly and there is no danger of it bending or breaking. The needles have been kept sharp and bright by polishing them on a cake of Sapolio.

Preliminary Medication.—The patient now receives $\frac{1}{4}$ grain of morphin sulphate hypodermically, to quiet any anxiety, and to put his mind at rest and make him indifferent to his surroundings and the progress of the operation. While we are waiting about fifteen minutes for the morphin to take effect I want to show you that we prepare the operating table for a local anesthesia operation by padding with a couple of blankets. The patient says it is as comfortable as his bed at home. This is to prevent backache and that tired, restless feeling that comes over the local anesthesia patient after the first half-hour spent on the average operating table. We are going to sit down while operating on this man; we can work most comfortably seated on high stools, and it does away with one objection many have to local anesthesia—its tediousness. No one is allowed to lean on the patient or to rest his elbows on him.

Before beginning the operation I want to return for a moment to the discussion of the isotonic normal salt and Ringer's solution. Corning in 1815 discovered that anesthesia was more prompt when the solution was isotonic. Three years later Liebriech called attention to the fact that plain or distilled water injected into healthy tissues was irritating, that it would produce pain before anesthesia—"anesthetica dolorosa." Allen more recently has shown conclusively that healing is more rapid when isotonic solutions are employed in local anesthesia. With the patient's consent I will demonstrate to you the irritating effects of hypodermics of plain and distilled water. Watch his face while I inject 5 minims of plain boiled water. He winces and complains of a cutting knife-like pain the moment the injection is made. Just above the first injection I make another of plain distilled water. He says it hurts as bad as the first one. Now I inject 5 minims of normal salt solution. He smiles and says it doesn't hurt a bit. The same pleasing result follows an injection of Ringer's solution. The use of an isotonic solution not only promotes prompt healing but also actually adds to the success of the anesthesia, because it provokes no pain when injected. As you know, the anesthetic itself does not take effect for at least five minutes.

The field of operation has been prepared in the usual manner. The line of incision lies ½ inch internal and parallel to Poupart's ligament. It extends from about 2 inches above the internal ring to the upper part of the scrotum, just below the external ring. So that the infiltration will be made straight I mark the line of incision with an ordinary soft lead pencil that has been boiled with the instruments, first moistening the point with sterile water. We will take up separately the anesthesia of the skin, subcutaneous tissues, the deep nerves, and the parietal peritoneum of the neck of the sac. Follow closely and you will observe just how the nerves in each layer are blocked.

Anesthesia of the Skin.—I will put a drop of phenol at the upper end of the line of incision, to act as a local anesthetic for the first injection. Ethyl chlorid is equally satisfactory for this purpose. I tell the patient that the first prick of the needle will hurt slightly. He says go ahead, so I gently thrust the fine needle through the anesthetized area, steadying the skin by pinching it up between the thumb and forefinger, and the patient remarks that it didn't really hurt after all. I am holding the needle nearly parallel with the skin surface, the point is very superficial, just within the epidermis or scarf skin. Look carefully and you can plainly see the needle point intradermal. As you know, the terminal filaments of the sensory nerves are in the deep layers of the epidermis where we gently force the solution until a wheal the size of a dime is formed. The patient says it does not hurt, which is because our solution is isotonic. I push the needle forward about $\frac{1}{3}$ inch and form another dime-shaped wheal. We now change to the larger needle and continue the infiltration, each time reinserting the needle through the edge of the last wheal. The patient says he does not feel it. The blanching effect of the adrenalin shows us just how far the anesthesia extends. The skin infiltration is completed and you see the series of wheals we have made have fused into a continuous line about $\frac{1}{3}$ inch wide. Because of the adrenalin we added to the solution anesthesia will last at least an hour, so we need not hurry.

Anesthesia of Subcutaneous Tissues.—I will inject the subcutaneous tissues down to the aponeurosis of the external oblique before making the skin incision. It can be done quicker now, and we will get a better anesthesia than if we wait until the skin is cut to make the infiltration. This time I insert the needle at a right angle to the skin and push it directly downward. As soon as it passes the epidermal layer I make gentle pressure on the plunger to form a path of anesthesia right down to the aponeurosis. The needle is withdrawn for each of these infiltrations which are made about $\frac{1}{2}$ inch apart and deposit 10 to 20 minims at each point. We must now wait a few minutes for anesthesia to become complete. Right here I want to emphasize one thing—you must wait for anesthesia. If you begin too soon and hurt your patient you lose his confidence right at the beginning, and you are liable not to regain it. Many operators fail with local anesthesia because they disregard this point.

We will handle the instruments quietly, and our operating-room conversation must be such that it does not alarm or disturb the patient, who is very much awake and asks that we talk to him while we are working. We will remember that gentleness in handling the tissues is one of the prime factors for success.

After waiting five minutes I test the anesthesia by touching the skin at different points along the line of incision with a needle, each time asking the patient if it hurts. He does not feel the needle prick anywhere, so we know that anesthesia is complete. I now incise the skin with a sharp scalpel, which I will then discard, and use a fresh one for cutting the subcutaneous tissue. The patient complains of the pressure of the scalpel being uncomfortable, although there is no pain. Accordingly, we will use only scissors for our dissecting during the remainder of the operation. You notice I have a small piece of gauze between the handles of the scissors to prevent any clicking sound which might make the patient nervous. Here you can see two small blood-vessels running across the field. I am carefully freeing them from their minute plexus of nerves in the fatty tissue, then there will be no pain when they are clamped between hemostats and cut. We will leave the hemostats on until the operation is finished and then the vessels will not need ligating. It is important to keep the field as dry as possible so that each layer of tissue can be easily recognized. Sponging is done lightly—the "velvet touch" method—instead of the swabbing style that is permissible under general narcosis, but which causes pain with local anesthesia.

Blocking the Deep Nerves.—We have now exposed the glistening aponeurosis of the external oblique. Using the fine needle I inject a few minims of the anesthetic beneath the aponeurosis, just below the center of the incision, where I believe we will find the ilio-inguinal nerve. The nerve lies on top of the internal oblique muscle and is often adherent to the aponeurosis. You must not cut it. As the solution is injected it forces its way from the aponeurosis and out of danger. Picking up the aponeurosis with anatomic forceps, I carefully incise it for a distance of 1 inch. Retracting the edges, you can see a small white cord running diagonally across the field—the ilio-inguinal nerve. I touch it with the forceps and the patient complains of a burning pain radiating down toward the scrotum. With the aponeurosis retracted, I infiltrate a few minims of the anesthetic with the fine needle into the nerve sheath as high up on the nerve as possible. The ilio-inguinal nerve usually supplies nine-tenths of the sensation in the inguinal region. Extending the incision in the aponeurosis upward, we find the iliohypogastric about $\frac{1}{2}$ inch above the ilio-inguinal nerve. We block it high up, as we did the ilio-inguinal. The iliohypogastric is not always found; sometimes it is absent, and instead we find a large ilio-inguinal, or vice versa. The ilio-inguinal and iliohypogastric inosculate near the anterior superior spine, and for this reason it is always important to block both nerves when they can be found.

The incision in the aponeurosis is now extended down to the external ring. I pick up both nerves with anatomic forceps and the patient says he does not feel it. This is our sign of complete anesthesia. We ask the patient to cough, and the sac bulges up into the wound and is easily located. We will do a modified Bassini operation that has given over 90 per cent. of cures. The sac is very adherent to the cord, and instead of stripping it off with gauze, which might cause pain, we free it by sharp dissection with scissors up to the internal ring.

Anesthesia of the Neck of the Sac.—Opening the neck of the sac, we inject a few minims of the anesthetic into the parietal peritoneum at the internal ring. This is necessary because the parietal peritoneum is very sensitive and is not innervated by the ilio-inguinal or iliohypogastric nerve. I ligate the sac high, so that when it is cut off the stump disappears by the elasticity of the peritoneum, and I free the cord preliminary to transplanting it. In some patients the cord is short, due to an incompletely descended testicle, when before freeing the sac it is often advisable to block the genital branch of the genitocrural nerve which runs along the bottom of the inguinal canal, or on the posterior surface of the cord. It is not necessary to search for this nerve, a couple of deep infiltrations at the upper part of the cord will permit a painless transplantation. However, in this case the cord is of normal length and we need not concern ourselves with the genitocrural. With the cord freed, I place the deep sutures just as if the patient were under general anesthesia. I like to separate the inner flap of the external oblique aponeurosis for a distance of a couple of inches from the internal oblique muscle to provide plenty of room for the cord structures. This avoids the postoperative swelling of the cord and epididymis which occasionally follows the regular Bassini operation, and at the same time it makes the patient's convalescence more comfortable and minimizes the danger of atrophy of the testicle. We overlap the aponeurosis, close the subcutaneous tissues in the usual manner, and use a running subcuticular suture for the skin.

The operation has consumed an hour's time, and we ask the patient if he wants the other side done now or in a few days, and he says to do it now. Our apothesin solution is ready and we proceed with the same technic as in the first operation. By the time we come to the closing of the wound the patient has become tired waiting for us to finish and has fallen asleep. This smaller hernia has consumed only a half hour. I always operate on the larger side first, while the patient is fresh.

I want to mention one point regarding large or complicated hernias. Sometimes the operation lasts longer than the anesthesia in the skin. If the patient become restless and complains of a vague general soreness in the wound, it is a good sign that cutaneous sensibility has returned. It takes but a couple of minutes to reanesthetize the skin by injections under the cut edges, and the patient is again quiet and comfortable.

The operation finished, the patient is returned to his bed, and as he remarks that he is hungry he will have a bowl of hot thin soup or a cup of coffee. He will be kept comfortable with morphin or codein. For the prevention of gas pains he will receive 5 grains of salol every four to six hours and $\frac{1}{2}$ ampule of pituitrin with atropin sulphate (grain $\frac{1}{300}$) every three hours for about eight doses. He is encouraged to turn on either side and move around in bed as much as he will. Heat over the abdomen aids peristalsis. He will receive a cathartic this evening and an enema in the morning.

CLINIC OF DR. HUGH N. MacKECHNIE

Frances Willard Hospital

SILENT APPENDICAL ABSCESSES IN CHILDREN

Summary: Diagnosis and treatment of appendical abscess in children. Related postoperative conditions demanding surgical interference.

This patient, aged seven years, complains of pain in his right iliac fossa, which prevents him from eating as he wishes, and also keeps him from playing with his usual vim. Five days ago he came home from school complaining of a stomach ache attributed to a kick in the abdomen, to wet feet, and to eating freely of candy in the morning. He vomited once. He remained home in the afternoon and rested. During the evening he appeared feverish, but his temperature was not taken. The next morning he felt better and insisted on going to school. He ate a good breakfast and went to stool as usual. During the day his side hurt him and he came home with considerable stomach ache. He was kept in bed Friday, Saturday, and Sunday, but the pain did not go away. His appetite has grown poor and on Sunday he appeared slightly feverish. Temperature was not taken.

Today, five days after his first complaint, I was called to see him and found him flushed but quite bright and cheerful; a tense expression; tongue red on edge and brown coated, dry in center; temperature 100.4° F.; pulse 96, soft, full, and compressible. Chest was clear; heart sounds good. Abdomen was full and rounded. Right rectus muscle was quite tense, while the left rectus muscle was fairly soft. At McBurney's point there was marked sensitiveness and apparently a smooth, round mass, deeply placed. Leukocyte count was 14,500; no differential count made.

A diagnosis of appendical abscess, possibly retrocecal in origin, has been made, and I am about to operate on that diagnosis.

Operation.—On opening the abdomen a mass the size of an orange covered by omentum comes to view. This we open, thus releasing a large quantity of fecal pus. The appendix is not easily found, and will be left to slough off with drainage or be removed at a later date. A tube with gauze is placed in the wound and the layers sutured around it. If it were readily found, the appendix would be removed, provided this could be done without much traumatism or disturbance of the limiting exudate.

Postoperative Note.—The patient made a good recovery and drained for three weeks. It is very doubtful if the appendix came out with the drainage.

Two conditions may arise in these cases necessitating future surgical interference. The original infection may not have been sufficiently severe to destroy the appendix or the drainage-tube may not have been left in long enough to give time for the primary infection to die out. As a result a secondary attack may develop at any time and demand operation. If such should occur, early attention would make possible, first, the removal of the appendix and the secondary focus, and second, the removal of the scar tissue formed from the drainage. Early attention would permit of such radical and clean work that no drainage would be necessary. Again, from the large amount of scar tissue and adhesions forming in these cases, we may have ileus develop to a greater or less degree. It may be such as slightly to disturb digestion, produce constipation or dilatation of the gastro-intestinal tract, or be in the nature of a complete obstruction. Any of these conditions may grow so annoying or acute as to demand surgical relief. In such cases the scar tissue with the appendix may be removed and the abdomen closed without drainage.

The case just operated on resembles closely another one of recent occurrence. The history of the second case is as follows: A boy aged eleven years, came home from school with a severe stomach ache. He had vomited while at school. The family physician was called and gave him a digestant, laxative mixture. He ate no supper. His bowels were regular and had moved during the morning. During the night the pain decreased and next morning the patient was much better. He did not wish to go to school and remained in bed. His appetite was good and he was allowed to eat in moderation. On the fifth day, because he appeared flushed, had no appetite, and continued to have soreness in the side, I was called to see him.

Examination showed a well-nourished boy, bright and cheerful, and somewhat flushed. Tongue was coated, brown and dry in the center and red on the edges. Temperature was 101.2° F. and pulse 110. White blood count was 15,300. Chest was clear and heart was good. Abdomen was rather rigid, especially on the right side, and tympanitic. There was a noticeable mass just above the pubes in the center and to the right, which was quite sensitive. There was no marked mass in the right iliac fossa. Rectal examination showed a mass in the pelvis, which was rather soft and quite sensitive.

A diagnosis of ruptured appendical abscess re-formed in the pelvis was made.

This diagnosis was verified at operation. The appendix was found lying in the iliac fossa on the wall of the abscess. It had sloughed off $\frac{3}{4}$ inch from its base. The distal portion was attached to the meso-appendix and its blood-supply. The abscess was in the pelvis and not in the iliac fossa. The appendix was removed and the abscess drained.

At the end of three weeks it healed and recovery was excellent.

These 2 cases are illustrative of what so often occurs in children. The appendix ruptures early without the marked pain usually found in adults in an acute condition which goes on to rupture. A slight stomach ache, a little distress, pain, as from a blow, may in these little ones presage a more serious condition than the symptoms indicate. The infection tends to wall off and become localized. This does not always occur. Fortunately, the youthful tissues react very strongly, an exudate is produced which walls off quickly, absorption decreases, and the symptom-complex is not of a violent type.

Children frequently are up and about with conditions which would hospitalize an adult. In an adult the pain and tenderness in these cases would not be borne without complaint. Possibly the realization of danger makes the adult more cautious, but it is a fact that he will not persist in going around in such conditions as will the child. These things should be borne in mind while examining children and due allowance made when summing up a case for diagnosis.

FOREIGN BODY IMPACTED AT ILEOCECAL JUNCTION

Summary: Surgical pathology, indications for operation, and prognosis of impaction of non-occluding foreign body in intestine.

This little girl swallowed a small gold baby-pin while being undressed four days ago. The mother distinctly remembered shutting the pin as she took it out of the clothes and laying it down. I was called to see the baby and advised a voluminous, rather solid diet in the hope that the pin would pass through without complications. At the end of twenty-four hours we took a skiagraph to ascertain its whereabouts, and found it in the region of the ileocecal valve, apparently across the opening. We waited two days more, during which time the stools were carefully examined. Signs of developing peritonitis due to perforation or of obstruction were watched for, but not found. Another skiagram was taken, and the pin was found apparently in the same place (Fig. 106). This being the case, it has been felt best to operate, because, first, the pin has made no progress in two days; second, it appears to be across the ileocecal valve and might at any moment produce acute ileus; third, it may cause necrosis of the intestinal wall with rupture and peritonitis and possible death; fourth, it may, by pressure necrosis, work its way through the ileocecal valve and produce a resultant cicatrix at this point, which may, in turn, cause chronic ileus.

A right rectus incision, as for appendectomy, will prove best for our purpose. The ileocecal junction is brought up and the pin is readily located. It is placed transversely to the ileocecal opening; there is some plastic exudate on the peritoneum at the ileocecal junction, where pressure is greatest. There is no extensive peritonitis. The mucous membrane and muscularis feel thin at that point, but there is a thickening of serosa and subserosa. I open the ileum at a point free from pressure and remove the pin. The valve is quite open in an apparent effort to stretch and let the pin pass. The mucous membrane of the ileum where the pin was pressing is being destroyed. It is worth noting these things because the prognosis as to morbidity depends on the extent of the trauma. The wound in the ileum is closed with two layers of silk applied longitudinally. It is not necessary to reinforce the points of pressure. The abdomen is closed by layer suture.

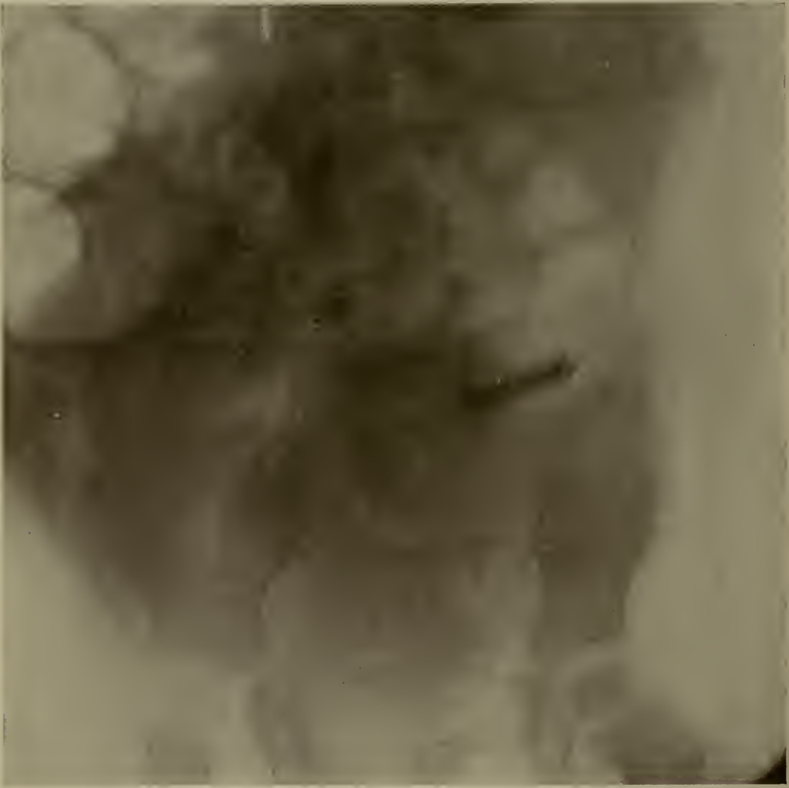

Fig. 106.—Roentgenogram showing shadow of pin in ileocecal region.

The prognosis as to mortality is good. Without unforeseen mishap this child will get well. As to morbidity, we should expect none. There has not been sufficient trauma or plastic exudate to produce a cicatrix with contraction, and consequently no ileus should develop. Children of this age frequently develop protrusion at the abdominal incision because of the poor muscle and fascia development and because of the inevitable crying and straining that follow an operation. If they are kept tightly bandaged with a small compress over the incision for a time the tendency to hernia will be minimized.

CLINIC OF DR. ARTHUR DEAN BEVAN

Presbyterian Hospital

CARCINOMA OF THE STOMACH—ANTERIOR GASTRO-ENTEROSTOMY

Summary: Massive carcinoma of the stomach—treatment. Anterior gastro-enterostomy; when indicated. Technic—necessity of a long jejunal loop. Postoperative management—castor oil and sodium bicarbonate as exciters of gastric peristalsis. Clinical pathology of "leather-bottle" stomach.

The second case that I shall present to you this morning is a patient of Dr. Abbott's. Dr. Abbott has studied the case and gives us the following facts:

The patient comes complaining of stomach distress. There is no marked pyloric obstructive symptoms. Examination of the stomach contents shows absence of free hydrochloric acid and the presence of blood. There is also blood in the stools. *x*-Ray examination shows a large filling defect at the pylorus. There is a definite palpable tumor to be felt a little to the right of the median line and just below the costal arch and the xiphoid. The man has lost 20 or 30 pounds in weight. He gives no history suggestive of stomach or duodenal ulcer. The Wassermann is negative. The clinical diagnosis is carcinoma at the pylorus, possibly operable.

The operation which we shall undertake is exploratory in the sense that it will determine, first, the diagnosis, and, second, the method of surgical procedure which should be adopted. Although the clinical diagnosis is probably 95 per cent. in favor of carcinoma at the pylorus, one would have to admit in a group of these cases the possibility of a massive ulcer producing these symptoms, and this an exploratory will be required to determine; then if we find, let us say, that the lesion is a carcinoma we must decide whether it is wise to resect, do a palliative operation, or make the operation purely exploratory and close without doing anything further.

The patient is now etherized, and I want to call your attention to the incision we shall make here. Beginning in the angle between the ensiform cartilage and the left costal arch and a little to the left of the median line, we carry our incision down a little to the left of the median line to just above the level of the umbilicus. We go to the left of the median line in order to avoid the round ligament of the liver. Dividing the skin and superficial fascia and the anterior sheath of the rectus, the posterior sheath of the rectus, and the peritoneum, we now open freely into the peritoneal cavity. The left lobe of the liver first comes into view at the upper angle of our incision, and then the stomach. As I draw the stomach out you see that we have to deal with a very large carcinoma, much larger than I imagined from physical examination of the patient or from the *x*-ray pictures. This carcinoma begins at the pylorus and does not involve the duodenum; it is about $2\frac{1}{2}$ to 3 inches in diameter. The main mass is about 3 inches in length; that is, it extends from the pylorus to the left on the pyloric end of the stomach to that extent. As I draw the stomach into view I find that the carcinoma extends along the lesser curvature as a broad mass, sickle-shaped, up as far as the esophageal opening. As I examine the greater curvature, I find the tumor also involves the greater curvature of the stomach. Dividing the peritoneum between the stomach and transverse colon in order to see the posterior surface of the stomach, I find that the posterior surface of the stomach is so extensively involved that we could not use the posterior surface in doing a gastro-enterostomy. Pulling the entire stomach as far out of the external wound as I can without too great tension, I find that the only part of the stomach which is at all normal is the anterior surface to the right of the carcinoma, the normal portion beginning about 4 inches from the pylorus. This we can safely use in doing a gastro-enterostomy.

Inasmuch as we cannot do a posterior gastro-enterostomy, we will do our old-fashioned original anterior gastro-enterostomy which is, under certain circumstances, a very serviceable operation. It must, however, be correctly done. The loop of jejunum must be a long loop and not a short one. I usually use a portion of the jejunum about 15 inches from the jejunoduodenal junction in making this anastomosis. I therefore measure off about 15 inches of the intestine, and find that at that point the mesentery of the jejunum is long enough to permit me to bring it in contact with the anterior surface of the stomach without tension. I now clamp the free normal portion of the anterior stomach wall with intestinal clamps, and this loop of the jejunum in the same way, and make an anastomosis with three rows of sutures. I would like to call your attention to the fact that the jejunum, as I first picked it up, was very much contracted and in a spastic condition and not much wider than my index-finger. Just as soon as I completed this operation and the gas and stomach contents could pass from the stomach into the jejunum, this portion of the jejunum at once dilated until it is now four or five times the size that it was before we made the anastomosis, showing that it begins to functionate immediately after we remove the clamps.

It is hardly necessary for me to emphasize the fact that this is purely a palliative operation. There is only one condition in which an operation of this kind proves to be curative, and we have experienced that exception in several cases, that is, where the tumor which we regarded as carcinoma is not carcinoma at all, but a massive ulcer, and in cases of that kind what is undertaken as a purely palliative operation proves, in fact, to be curative. We have several times had this experience. I have no doubt of the correctness of the diagnosis of carcinoma here, but in some cases where we were certain that the mass at the pylorus was carcinoma and not an edematous mass produced by a large ulcer, we have given an unfavorable prognosis, and then we have been surprised a year or two years later to find that the patient was not only living and well, but had recovered completely from the condition, and that there had been a complete disappearance of the growth, proving that our clinical diagnosis was wrong and that the patient had not a carcinoma, but an ulcer.

I am not overenthusiastic about these palliative operations in cancer of the stomach, and yet they are clearly indicated in cases of this kind, even in cancer. Many of these patients have gained 20 or 30 pounds in weight and are given palliation for six months or a year or even longer by gastro-enterostomy.

The external incision is closed completely without drainage. The after-management is simply that for the first twenty-four hours the patient will be given 8 or 10 ounces of normal salt solution every three or four hours per rectum. At the end of twenty-four hours we begin with 1 ounce of water by mouth every hour, and if it is borne without vomiting, in twelve hours milk and cream and broth are given in small amounts. If vomiting (after the legitimate anesthetic vomiting) persists, we do not hesitate to wash out the stomach, relying on the integrity of our suturing, and we do this even inside the first twenty-four hours in many cases. There is one thing that we have learned in handling these gastro-enterostomies, that is, the desirability of stimulating stomach peristalsis so that the stomach can empty itself. In order to encourage this, in addition to washing out the stomach we have found several other means of value: first, the use of a little bicarbonate of soda and calcined magnesia, 10 grains each, every hour, and in some cases I have found a very small amount, ½ or 1 dram, of castor oil, given every hour or two, has been of value in preventing the development of gastric ileus and the development of what a number of years ago we saw very frequently, namely, vicious circle; and vicious circle occurred, I am quite sure, in the old-time anterior gastro-enterostomy more frequently than it does now by the posterior method. I would not be dogmatic in my statements in regard to the value of these mild stimulants to peristalsis, such as calcined magnesia and castor oil, and yet our experience in quite a number of cases seems to show that they have been of value. I do not think they should be overdone, and frequently it is necessary to assist them by washing out the stomach every six or eight hours.

The extensive invasion of this stomach reminds one of the cases that have been described in the literature as "leather-bottle" stomachs. These "leather-bottle" stomachs occur in two pathologic conditions—one carcinoma, the other syphilis. I do not mean to say that this is an example of a pure type of "leather-bottle" stomach, but the extent of the invasion, especially on the posterior surface, reminds one very much of that type of lesion. I think, however, the term should be limited to cases in which we have not a distinct tumor to deal with, but in which there is wide invasion of a large portion of the stomach wall and general thickening of the wall, so that it reminds one of a "leather bottle" made out of very thick material. We have had a number of these cases to deal with. Sometimes the lesion involves the entire stomach, so that a gastro-enterostomy cannot be considered, and the only thing that can be done is a complete extirpation, and this, of course, should not be done if there is any glandular involvement that cannot be removed or any evidence of secondary carcinoma. The great majority of these "leather-bottle" stomachs are carcinoma. Occasionally they are undoubtedly specific. There is a third group of cases in which we find a positive Wassermann, suggestive, therefore, of a syphilitic pathology of the stomach lesion, in which, however, a very careful microscopic examination shows that the lesion is carcinoma occurring in a syphilitic individual.

CARCINOMA OF THE SPLENIC FLEXURE

Summary: Technic of abdominal exploration—discovery of carcinoma of splenic flexure in present case. Treatment—the Mikulicz operation.

This patient, a man of fifty, has been referred to me by Dr. B. W. Sippy. The case has been under observation for a number of weeks and has been studied with unusual care. The records in the case are quite voluminous, and I shall simply give you a sketch of the important facts. The man complains of loss of weight and strength, diarrhea, and blood in his stools. There has been no evidence of intestinal obstruction, and after making an exhaustive research the internists have been able to eliminate the stomach and duodenum as a source of hemorrhage or of any trouble, and are able to exclude the rectum and sigmoid as a source of hemorrhage. We are, therefore, able to say with some degree of assurance that the lesion is either fairly high up in the large intestine or in the small intestine. The blood in the stools is mixed and is found in the center of the stools, and not on the outside of the stools, as we might expect it if the hemorrhage were from the rectum or from the sigmoid. A careful analysis of the stomach and duodenum fails to show anything abnormal. A careful physical examination of the abdomen fails to reveal any palpable masses. The patient has been fluoroscoped and the stomach and small intestine examined in this way, and also the large bowel, and no filling defect has been found. The clinical diagnosis, therefore, is that of a lesion of either the small intestine or the upper part of the large intestine, which has produced bleeding and diarrhea, but no evidence of obstruction, and has resulted in the loss of at least 50 pounds in weight in the last six months. One thinks of several possibilities, such as tuberculosis, carcinoma, and multiple polypi. I have gone over the records carefully and agree with the internists in their conclusion. It is, therefore, a case in which we must resort to an exploratory for the final diagnosis, and even this may not prove determinative.

Under ether anesthesia I am making, as you see, a midline laparotomy incision, one beginning in the midline about 3 inches above the umbilicus and extending around and about 3 inches below the umbilicus. This will enable me to make a very complete survey of the entire abdominal contents. Opening the peritoneum I find a quite free peritoneum. The liver comes into view at the upper angle of the incision. I inspect the gall-bladder, which is normal. I then inspect the stomach and duodenum, and find no evidence of either carcinoma or ulcer. I now pick up the colon and, rather to my surprise, I find in the transverse colon and in the ascending colon at the cecum a semisolid mass of fecal matter. This is an unusual finding and points to the possibility of some obstruction distal to this point. Running my hand along the transverse colon to the left side, at the upper part of the splenic flexure I find a massive carcinoma of the splenic flexure. I can trace the transverse colon into it and I can trace the descending colon leading down from it. It is two-thirds the size of my first, and you will be surprised at the size of this mass, because I stated to you that there was no palpable tumor found. The explanation is that the mass is entirely covered by the ribs, so that it would be impossible to palpate it.

I am not sure whether this is a case in which we can do a radical operation or not. I am somewhat undecided as to whether we shall attempt a radical operation or be satisfied with an anastomosis which will side-track this growth and relieve the patient temporarily of his distress. Of course, if it were possible to excise this mass it would be very desirable, and I think we would be justified in submitting the patient to a good deal of risk in our effort to accomplish this rather than to be satisfied with a purely palliative operation.

I extend the incision upward to the ensiform in order to give me plenty of room to attempt to remove this splenic flexure carcinoma. I find that the mass is attached to the spleen, and as I draw the mass down I draw the spleen into view, and there is a fairly broad adhesion about $\frac{3}{4}$ inch in width and $\frac{1}{6}$ inch in thickness extending from the splenic flexure up to the bottom of the spleen. I clamp this between two artery forceps and divide between. The first thing that must be accomplished in this case is the mobilization of this portion of the colon so that we can bring the involved colon freely into view and out of the external incision. In order to accomplish this it will be necessary for me to divide the outer avascular layer of the descending mesocolon and separate the transverse colon from the stomach (Fig. 107). The upper portion of the descending mesocolon is edematous and thickened, and I am afraid that this thickening means carcinoma, although it may be simply an edematous inflammatory thickening. I now divide the outer layer of the mesocolon so that we bring the mass fairly well into view (Fig. 108). I find that it is an adhesion to the pancreas and to the first piece of the jejunum. I can, however, with the gloved finger and without very much force separate the adhesion to the pancreas by blunt dissection; as I continue this downward I find that I have injured the first portion of the jejunum. For-

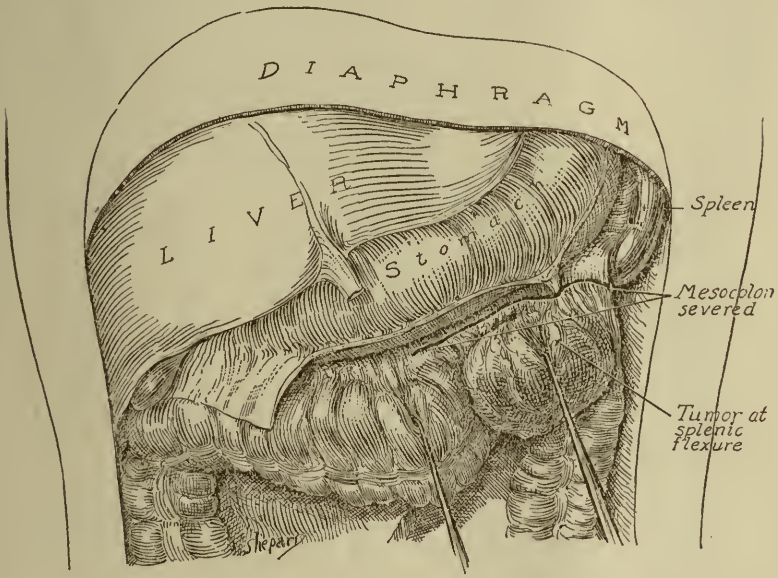

Fig. 107.—Diagram showing location of tumor and site of incision through transverse mesocolon and peritoneum lateral to descending colon for mobilization of splenic flexure.

tunately, I recognize this at once and close the opening in the gut with three layers of sutures, using Pagenstecher's linen. The raw surface from which I have dug out this huge carcinoma bleeds slightly and I pack it with a dry abdominal pad. There

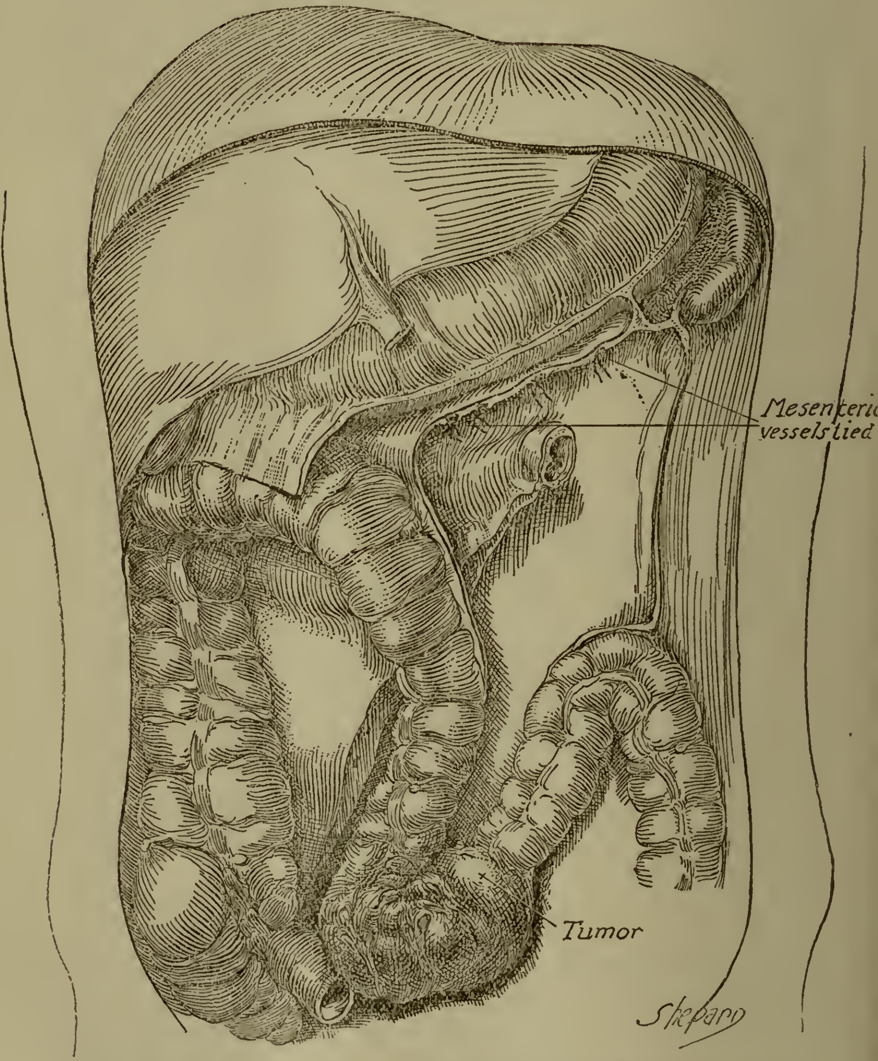

Fig. 108.—Diagram showing mobilization of splenic flexure completed.

are no vessels of any size which require ligating or suturing. I believe the safest plan will be to handle this by what is known as the Mikulicz method.

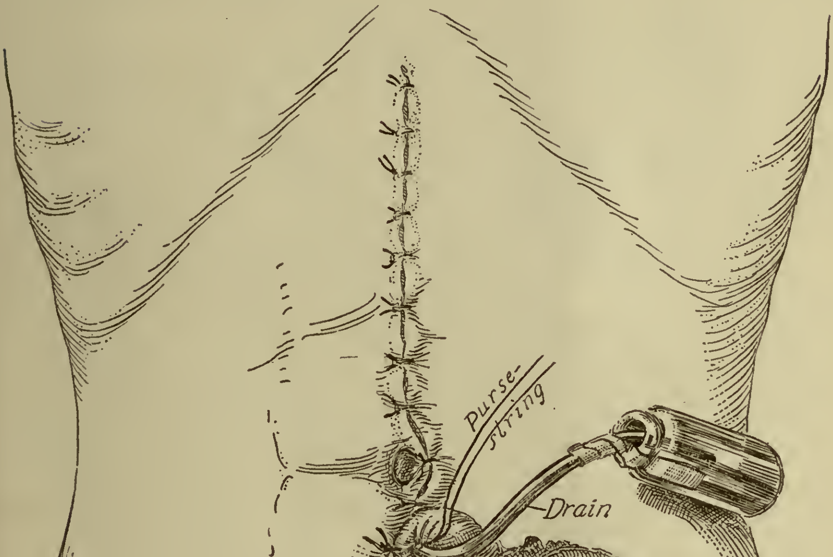

Fig. 109.—Tumor-bearing splenic flexure brought out of abdomen, and incision closed. Note catheter in proximal loop as safety-valve.

I shall bring the mass out of the abdomen and leave it out of the abdomen, without removing it at present, and close the upper three-fourths of the abdominal wound, leaving the lower portion just below the umbilicus open to an extent sufficient to accommodate the double loop of colon that we shall leave outside. In order to relieve any intra-intestinal tension and at the same time provide opportunity for us to introduce enough fluids

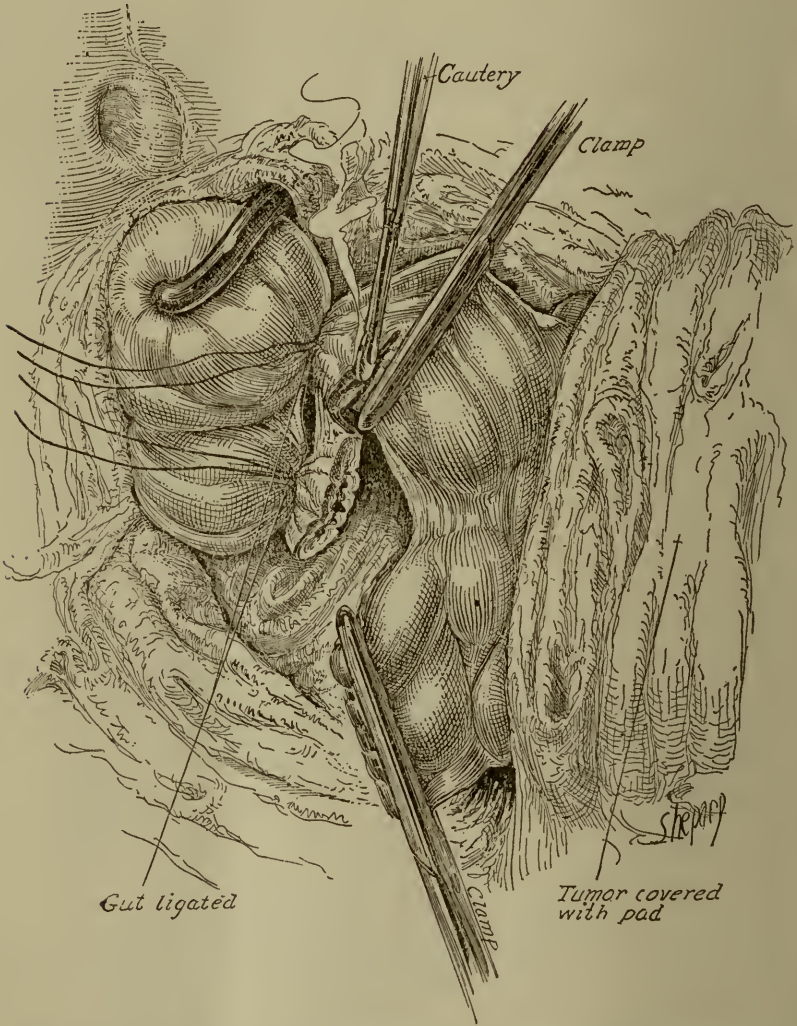

Fig. 110.—Removal of tumor-bearing tissue three days after primary operation.

into the patient, I shall sew into the proximal cecum, that is, the transverse colon side, a No. 14 American catheter (Fig. 109). I do this with a couple of purse-string sutures so as to make this perfectly water-tight. In the raw surface from which we removed this growth and which we have packed with a dry abdominal pad, I introduce some iodoform gauze after removing this abdominal pad. I dislike very much to leave this iodoform gauze in position. At the same time there is some oozing and I am not willing to take the chance of any hemorrhage here. I think it will be well controlled with an iodoform gauze pack. It is a distressing thing to use these iodoform gauze packs, because removal of them is very distressing to the patient and carries some risk, and I never use them unless their use is the least objectionable horn to a dilemma such as confronts us here.

If the patient recovers from the immediate effects of the operation we shall, at the end of three or four days, ligate both arms of this colon loop close to the abdominal wall with heavy silk ligatures, cut the bowel distal to the ligature with an electric cautery, and remove the mass (Fig. 110). This will give us a double-barrel colostomy opening, one extending into the descending colon and one into the transverse colon, coming out at the lower angle of our wound. After a week or ten days the septum between these two intestines will be clamped with heavy clamps with the idea of producing by pressure necrosis a large opening between the two portions of the colon (Fig. 111, *a*, *b*, *c*). This will permit of the free passage of fecal matter from the transverse colon into the descending colon, and the external opening will close to a greater or lesser extent. Sometimes these openings close completely. If they do not, at the end of a few weeks, under local anesthesia, a final operation can be made, closing the fistula into the bowel (Fig. 111, *d*). We do not like to resort to the Mikulicz operation. I prefer very much, as I have told you a number of times in these clinics, a primary radical resection or a colostomy and a radical resection and final closure of the colostomy wound to a Mikulicz operation. I think, however, that conditions do arise, as in this case, in which the Mikulicz operation is the preferable procedure.

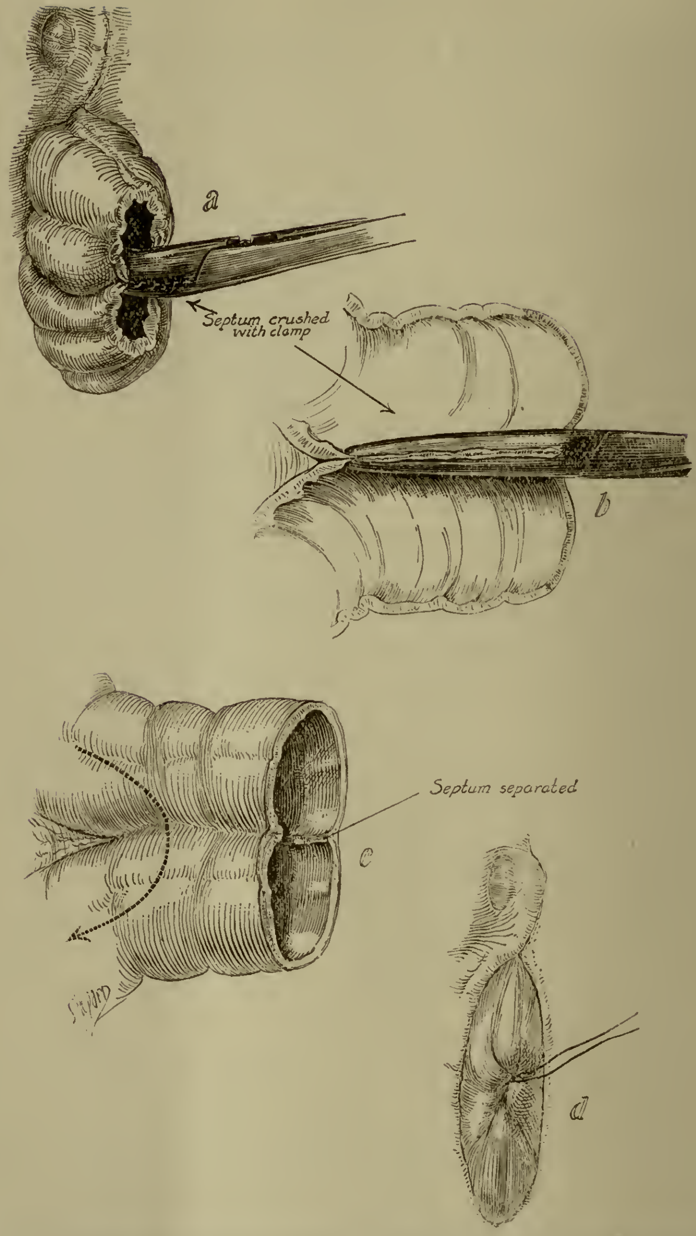

Fig. 111.—Diagram illustrating method of destroying septum between afferent and efferent loops, thus restoring continuity of colon.

The prognosis in this case I regard as extremely grave. I think the patient runs a very great risk—possibly a 50 per cent. risk—of dying from the operation. On the other hand, if he does recover I think he will have a very good palliation from his symptoms, although I do not believe there is much prospect of a radical cure.

IMPERFORATE ANUS

Summary: A case of imperforate anus with communication between bladder and rectum, cured by primary colostomy, secondary plugging of bladder-rectal fistula with bismuth paste, and final suture of open end of rectal pouch into normal position in perineum. Further remarks on imperforate anus.

In a clinic some weeks ago I had the opportunity of discussing the subject of imperforate anus rather fully and showing you several cases. Today we have a case of imperforate anus which we have had under observation for some time, which presents a number of interesting features.

This boy is now five years of age. He was brought to me a day or two after birth with an imperforate anus, and with the statement that meconium was being expelled from the urethra with the urine. I did at once a left-sided colostomy to save the child's life. He made a very good recovery and within a few weeks was quite a fine, strong child, normal in every way except for the colostomy opening taking the place of the normal anus.

When he was about three years of age his parents brought him back to me, and I restudied the case. I filled the blind pouch distal to the colostomy with barium and obtained a very excellent *x*-ray picture, which showed a large blind pouch coming down to within an inch of the sphincter. I planned making an essential Kraske operation, at least a posterior incision, removing if necessary the coccyx and bringing the blind pouch down to the sphincter opening and stitching the mucous membrane to the skin. While the child was under the anesthetic, however, in straining he forced a lot of barium out through the urethra as a solid mass, just as one might force vaselin out of a vaselin tube. As I watched this I decided to postpone the operation, as I came to the conclusion that the communication between the bladder and the rectum was apparently of such extent that it was probable that the bladder and rectum formed one cloaca, and that it would be difficult or impossible to do an operation that would enable us to separate these two viscera and obtain a good functional result, and that is the conclusion that I have arrived at from my study of these cases, that where the bladder and rectum form a large single cavity or are connected by a very large opening, it is difficult to plan any surgical procedure that will enable us to separate the viscera. I therefore at that time gave up the operation and allowed the child to come out from the anesthetic, and told the parents that I felt it was unwise to undertake the operation that I had planned. I asked them to bring the child back from time to time so that I could keep him under observation.

The child has grown up into an unusually bright and intelligent boy, and was brought back to the hospital a few days ago. Since that time I have been restudying the case and we have a good deal of additional interesting light. In the first place, since the boy was brought back to the hospital I had an *x*-ray picture taken, and, very much to my surprise, I found that the mass of barium that we had introduced two years before was still in the blind distal pouch and that it seemed to present exactly the same picture that it did when it was first introduced. The parents made this statement, that during the last week there had been a peculiar chalky fluid forced out from the distal end of the colostomy opening, not a large amount, but so that it could be distinctly seen on the dressings, and that this had not happened until a few days before he was brought to the hospital. As I studied this *x*-ray plate I found another interesting thing, that there was a thin, very narrow line of barium extending from the main mass apparently forward, as though it passed through the narrow canal extending from the blind pouch to the urethra, probably at the prostate or a little in front of the prostate. The urine of the child seems to be quite normal.

Examination of the evidence now at hand shows that we were mistaken in our first impressions, that the bladder and blind pouch do not form a single cavity and that the communication between the blind pouch and the urinary tract is through a narrow tract, leading from the blind pouch into the urethra, and this has been blocked up and possibly closed entirely by the use of the barium that was injected into the blind pouch two years ago. One can say this with a fair degree of certainty, because in spite of the fact that the barium is now being discharged from the distal end of the colostomy opening and there is a large mass of barium in the blind pouch, none has been discharged from the urethra and the urine is quite normal. These facts have encouraged me to undertake a radical operation in this case.

Under anesthesia the child is now placed on its face and abdomen and the operating table is broken so as to bring the posterior surface of the pelvis, sacrum, and coccyx high up in the air, in the same position that we do our Kraske operation for carcinoma of the rectum. The field of operation has been prepared and I now make a posterior incision extending from the lower end of the sacrum down almost to the external sphincter (Fig. 112, *a*). I call your attention to the fact that although there is no opening at the external sphincter, there is evidently very good development of the muscles in this region, as you can see by the movements of the perineum when the child cries. The incision is about 3½ inches in length, and as I divide through the soft tissues so that I can expose the rectum behind and separate the levator ani muscles, I come down to a layer of fat, and as I separate this fat I come down to the blind end of the rectum, and I can see the white barium shining through this pouch and can distinctly feel a hard mass of barium inside of this closed rectal pouch. I now carefully dissect out this rectal pouch, so that I can bring it well down into the wound and so that I can demonstrate to myself that if I open it I can stitch it into the sphincter without tension (Fig. 112, *b*).

The next step of the operation is to take a fine tenotome and, examining very carefully the position of the external sphincter, I make a small opening through the skin and center of the external sphincter with the tenotome. I then introduce into this opening a grooved director and alongside the grooved director a closed pair of artery forceps: I now stretch the small opening

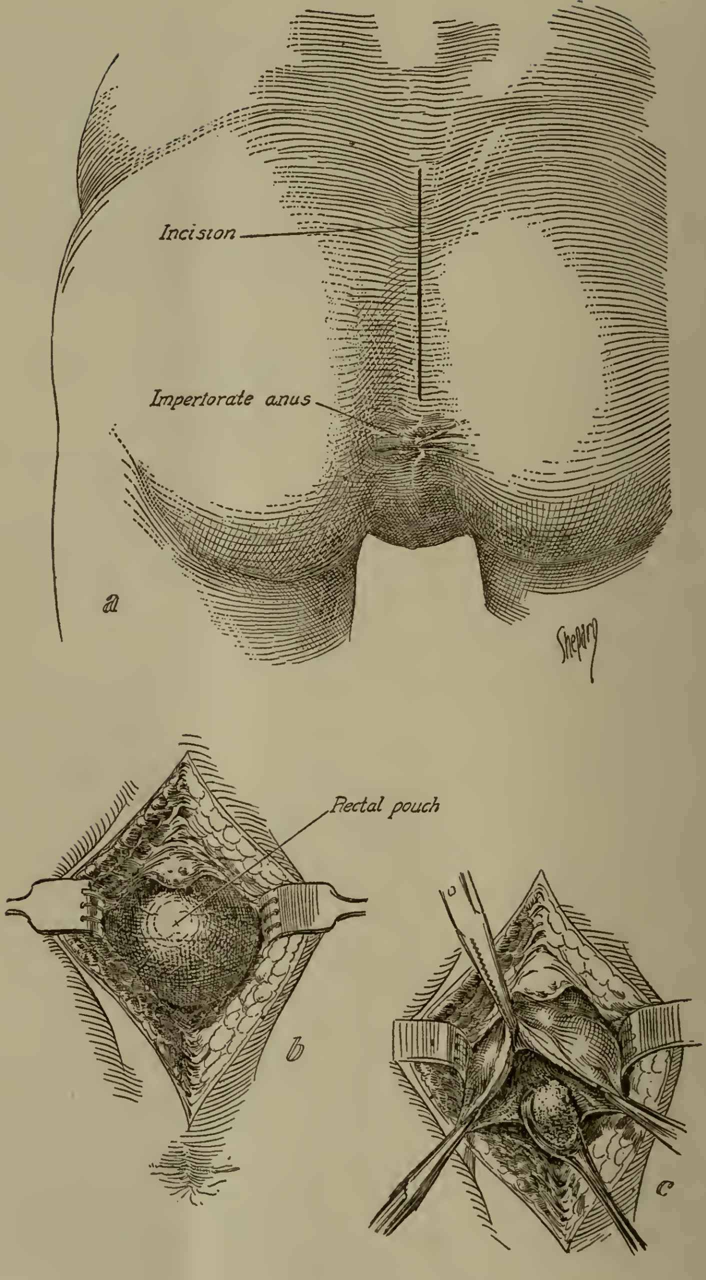

Fig. 112.

with the artery forceps so as to make a good-sized opening (Fig. 113, *a*, *b*). In doing this, of course, I separate the fibers of the external sphincter without doing them any injury. I now pack off my blind pouch from the operative field and open it, making an incision about ¾ inch on the apex of this pouch, and introducing a scoop, I now remove the barium. It is rather hard and firm like a mass of putty, but with little effort we can remove it. I find that in doing this a spoon-shaped periosteotome enables me to remove the barium more rapidly than any other instrument that I have on my instrument tray (Fig. 112, *c*). Wiping the open rectum with sponges, I introduce four rather small artery forceps through the opening which I have made at the sphincter, pass them up and grasp the opening that I have made in the rectum at four points, and then gently draw the rectum down so that the mucous membrane comes to the skin at the external sphincter (Fig. 113, *c*). I now unite the skin and mucous membrane of the rectum with eight fine black silk sutures. I am in this suturing uniting the skin to all the walls of the rectum, passing my needle not only through the mucous membrane but also through the muscularis (Fig. 113, *d*). I introduce into the distal and upper part of the wound just below the coccyx a small strip of iodofrom gauze and close this distal wound with silk sutures. In order to protect this line of suture from urine I shall dress it with zinc oxid paste. I have found in children in operations such as this and in spina bifida operations that a dressing with sterile zinc oxid paste has given me more protection against infection from fecal and urinary discharges than any other method of treatment that we have employed.

After-history.—I am glad to say that this little patient made an excellent recovery, the mucous membrane of the rectum and the skin uniting in a very satisfactory way, the distal incision closing rapidly, and healing completely within two weeks. The iodoform gauze was removed on the second day. Some barium was discharged through the external sphincter. No fecal mat-

---

Fig. 112.—Through a long incision (*a*) the rectal pouch, filled with barium two years previously, is exposed (*b*), the pouch opened, and the barium removed (*c*).

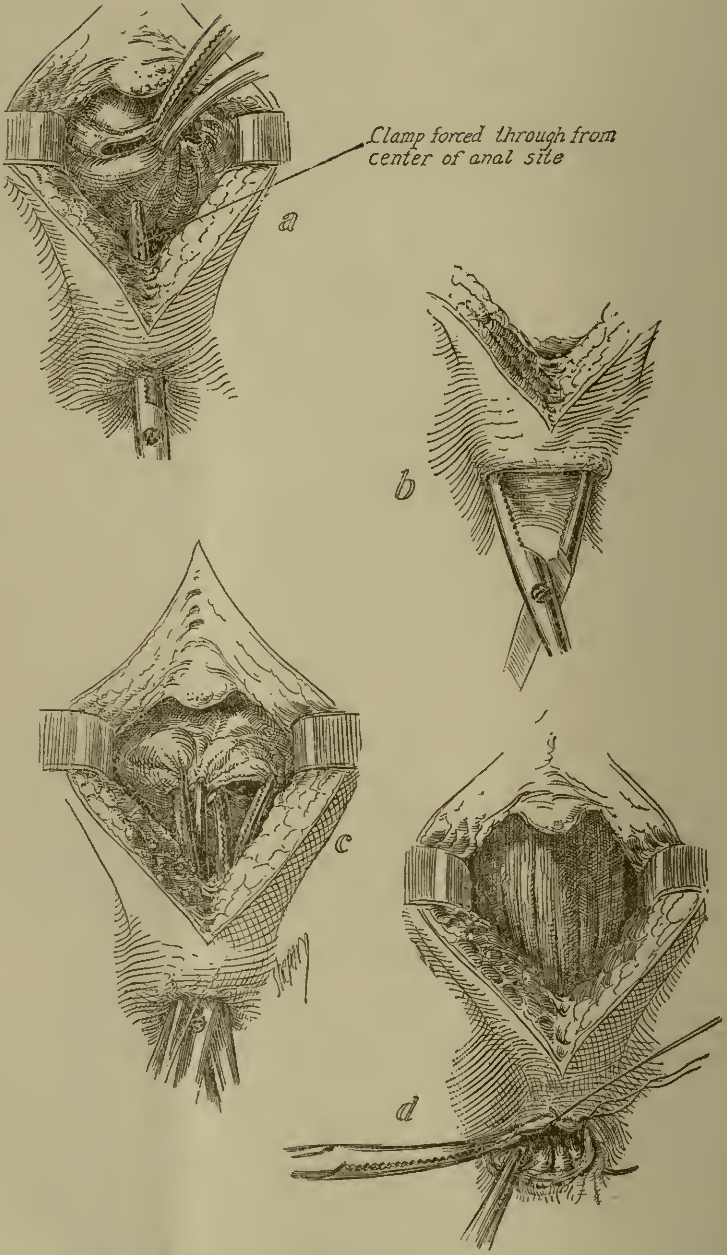
Clamp forced through from center of anal site

Fig. 113.

ter has passed through the new route because of the sharp bridge that still exists in the colostomy opening. I shall not do the last stage of the operation for six or eight weeks, until the boy recovers entirely from any evidence of his last operation. The final operation will, of course, be the closure of the colostomy opening, which, in this boy's case, we shall do under general anesthesia. In adults we have been, as a rule, doing this third stage of an operation of this type under local anesthesia. It is essential to have the co-operation of the patient in doing such an operation under local, and this, of course, we could not very well obtain in a boy five years of age. It is necessary in order to keep the new opening from contracting to keep a rubber tube in the new rectum. I have taught the mother how to clean and reintroduce this when it comes out.

This case has been very instructive to me. It forms the exception to the rule which we have formulated on the basis of our experience in this clinic with similar cases, that is, that it is usually wise in these cases of imperforate anus, where there is a connection between the lower end of the rectum and the bladder, to be satisfied with a permanent colostomy opening, and not to risk the life of the little patient in an attempt to separate the rectum and the bladder. This case demonstrates very beautifully that in some cases at least conditions warrant the attempt to separate the bladder from the rectum and obtain practically normal conditions.

One particularly interesting fact is met with in this case, that is, that we have been able to cure apparently with what amounts to bismuth paste the fistula that exists between the blind pouch and the urethra. To be sure, fortunately this was a very narrow fistula and so small that in our operation to bring the rectum down to the sphincter we have not encountered it at

---

Fig. 113.—An artery forceps is introduced through a small incision at the approximate center of the mass of sphincter muscles and the opening enlarged by forcible separation of the blades of the forceps (*a*, *b*). The edge of the opening in the rectal pouch is then seized (*c*) and the pouch drawn down until the walls of the pouch about the opening can be stitched to the recently made anal orifice (*d*).

all. Therefore, it must have been of very small size, and yet we know from positive evidence that this fistula did exist, and that under pressure before we made the colostomy meconium was forced out of the bladder; and that after we had introduced the barium into the distal pouch this barium was forced out through the urethra under the anesthetic. These pieces of evidence are definite and absolute.

FRACTURE OF THE MALAR BONE

Summary: Marked deformity following recent fracture of the malar bone. Demonstration of a simple method of reduction and fixation.

The second case I shall show you this morning is that of a medical colleague of mine who comes from an adjoining city and who recently met with an accident in cranking his automobile. The accident happened two days ago. He believes that the exact injury occurred in this way: when he was cranking the automobile it back-fired and he was thrown violently against the fender, his face striking the fender. He does not think that the handle of the crank struck his face. At any rate, he comes to us with the malar bone on the left side of his face driven in to the extent of about $\frac{3}{4}$ inch, showing, as you see, a very marked depression and a very great deformity. Fortunately, the eye was not injured, although there is very extensive contusion and some hemorrhage under the conjunctiva. There is no injury to the eye itself or to the muscles of the eye. The injury consists apparently entirely of a complete fracture of the malar bone, the breaking off of the malar at its junction with the superior maxilla and at its junction with the frontal bone, and at its junction with the zygoma. There seems to be no injury to the facial nerve in any way, but there is a very marked injury of the second division of the fifth nerve, as all the area of distribution of the second division of the fifth pair of nerves is paralyzed. I hope and believe that it is due simply to the contusion and that it will be temporary, and that there will be a restoration of function and sensation.

We have had this problem presented to us several times, and in some cases we have hesitated to do an open operation and elevate the depressed bone where the depression was slight, feeling that the scar resulting would be more of a deformity than the slight depression. In this case the depression is so marked that it becomes necessary to correct the deformity by elevating the bone. A number of surgeons have studied this problem and have solved it in different ways. A recent article described the handling of one of these cases by grasping the bone with a pair of cow-horn forceps, such as dentists use, grasping the bone with the points of these forceps and pulling it out into position. I have looked over our dental instruments and find it would be very difficult to employ a cow-horn forceps in this particular case. As I have studied the gross anatomy of the lesion on the skull it seems to me that we can solve the problem in a much easier way and elevate the bone without any scar or without any resulting deformity. I shall ask you to follow closely the plan which I shall carry out in this case.

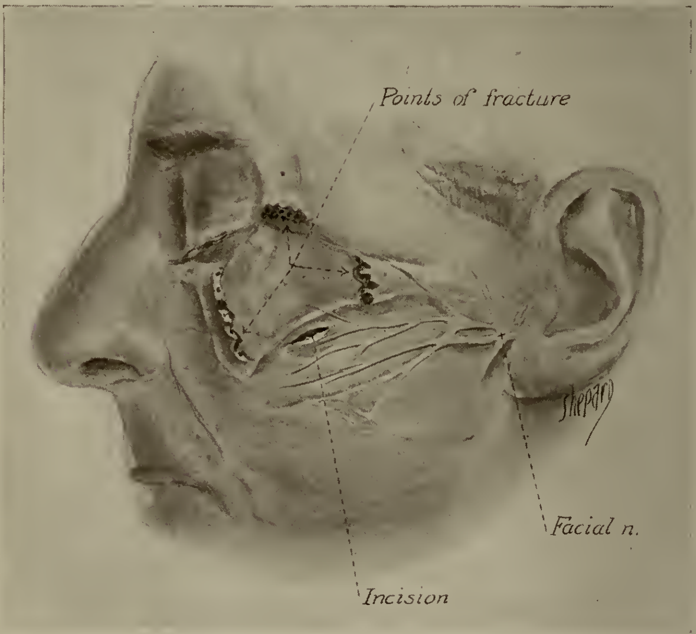

Fig. 114.—Diagram illustrating character of lesion in present case and incision through which instruments may be passed for correction of the deformity.

We shall anesthetize the patient with gas. The face has been quite carefully sterilized. I now take a fine tenotome and make a little incision at the lower border of the malar bone, an incision probably $\frac{1}{3}$ inch in length. I make this parallel with the course of the branches of the facial nerve in this region, so as to do little or no injury to any of these branches. This tenotome incision passes up to the posterior surface of the malar bone. I now take this stiff, narrow periosteal elevator and introduce it in this small incision made by the tenotome, and without

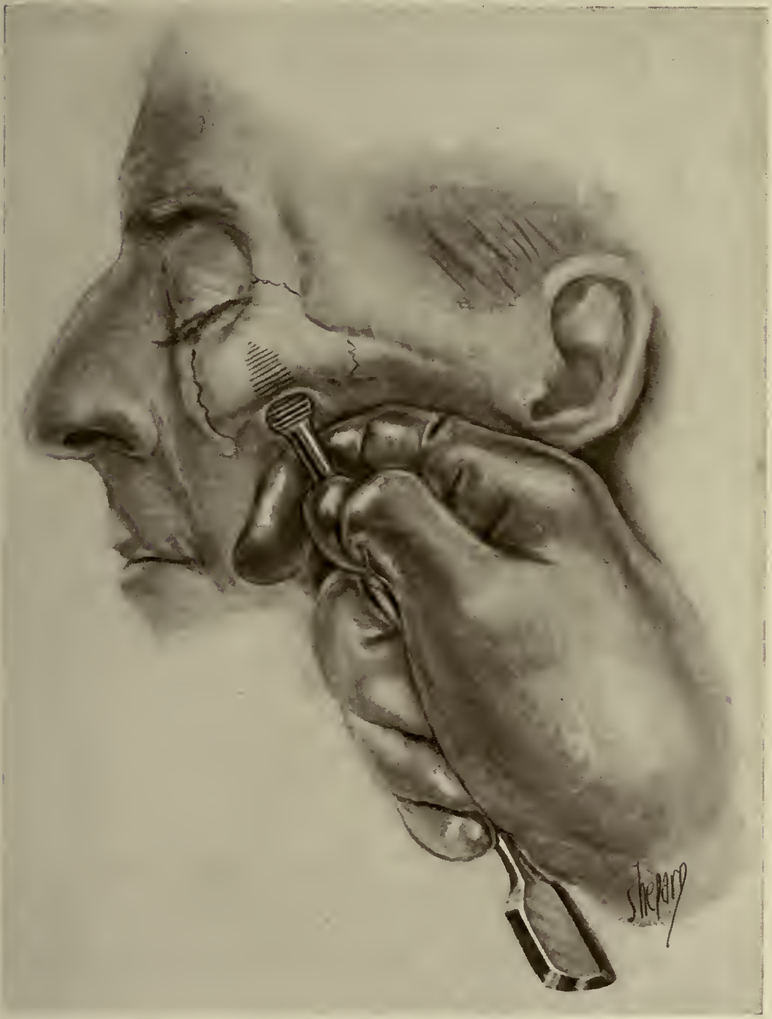

Fig. 115.—Fragment forced into position by means of stout periosteal elevator passed beneath bone through tenotomy incision.

any difficulty elevate first the portion of the malar bone which has been broken off from the superior maxilla and bring that accurately up in position. I now elevate that portion which unites with the malar process of the frontal, and as I do this I find that I elevate the bone quite perfectly into position, and that the last manipulation has brought the zygomatic process of the malar in accurate approximation to the zygomatic process of the temporal. I examine it now carefully before I allow the patient to come out from the gas, and I find we have apparently secured perfect reduction. The edges of the fracture are apparently so rough that there is now little likelihood of the bone assuming its former malposition. I test this out very carefully by grasping the bone in my fingers and find that simply to move it without my periosteotome is impossible. If I found that there was any tendency to recurrence of the displacement, and I have prepared myself for this contingency by having the head surgical nurse sterilize these large stiff, broad needles, I shall pass one beneath the malar bone through the skin so as to maintain the position and prevent any displacement. I do not believe, however, that this is necessary in this case, so we shall simply dress the wound with a small piece of iodoform gauze over the tenotome incision and then over this place a couple of layers of adhesive plaster, covering that side of the cheek, and giving, I think, some support to the bone and eliminating the chance of recurrence of the displacement.

After-history.—The patient was allowed to leave the hospital on the third day. The single suture that had been used to close the tenotomy incision was removed at that time. The patient was very much delighted with the result of the operation and with the disappearance of the deformity.

I would like to submit this method as being entirely satisfactory in cases of this kind; in fact, in any depressed fracture of the bones of the face. The two fundamental principles involved are elevation through small tenotomy incisions, which leave little or no scar, and the maintenence of the correct position; in other words, preventing recurrence of the deformity by the use of needles so placed as to prevent any depression of the fragments.

MUSCULOSPIRAL PARALYSIS: TREATMENT BY TENDON TRANSPLANTATION AND NERVE SUTURE

Summary: Extensive loss of tissue due to gunshot wound of the arm with complete paralysis of extensors of the wrist. Technic of transplantation of tendon of M. flexor carpi radialis to extensor tendons. Fundamentals of nerve suture—great value of actual end-to-end anastomosis. Prognosis.

This young man was injured eleven years ago. He was holding a shotgun in his hand and the muzzle of the gun was held in such a way that it was within a few inches of the elbow, so that when the gun went off it blew a hole through the arm just above the elbow. The gun was loaded with twelve buckshot and it was so close to the arm that the charge went through it like a solid bullet. There was evidently a very extensive compound fracture of the humerus 3 or 4 inches above the elbow-joint, with great tearing away of the soft tissues, including the musculospiral nerve. There has been no effort made to repair the nerve or to improve the function of the arm by tendon transplantation. There is good union of the humerus, but complete paralysis of the muscles supplied by the musculospiral below the point of injury. The patient is an unusually muscular man and has kept himself in excellent general physical condition in spite of the injury to the arm, the muscles of the other arm being unusually well developed, and the muscles of the injured extremity above the point of injury also stand out as great muscular masses.

I have studied the case with a good deal of care and have decided to do two things: to transplant the flexor carpi radialis and make of it an extensor of the hand and of the fingers, following a plan which I saw first practised by Murphy five or six years ago. I shall also make a direct suture of the musculospiral nerve. I want to call your attention to one interesting fact, that when he flexes the forearm at right angles to the arm it brings the scars of the wounds of entrance and exit almost opposite each other, showing that when we suture the musculo-

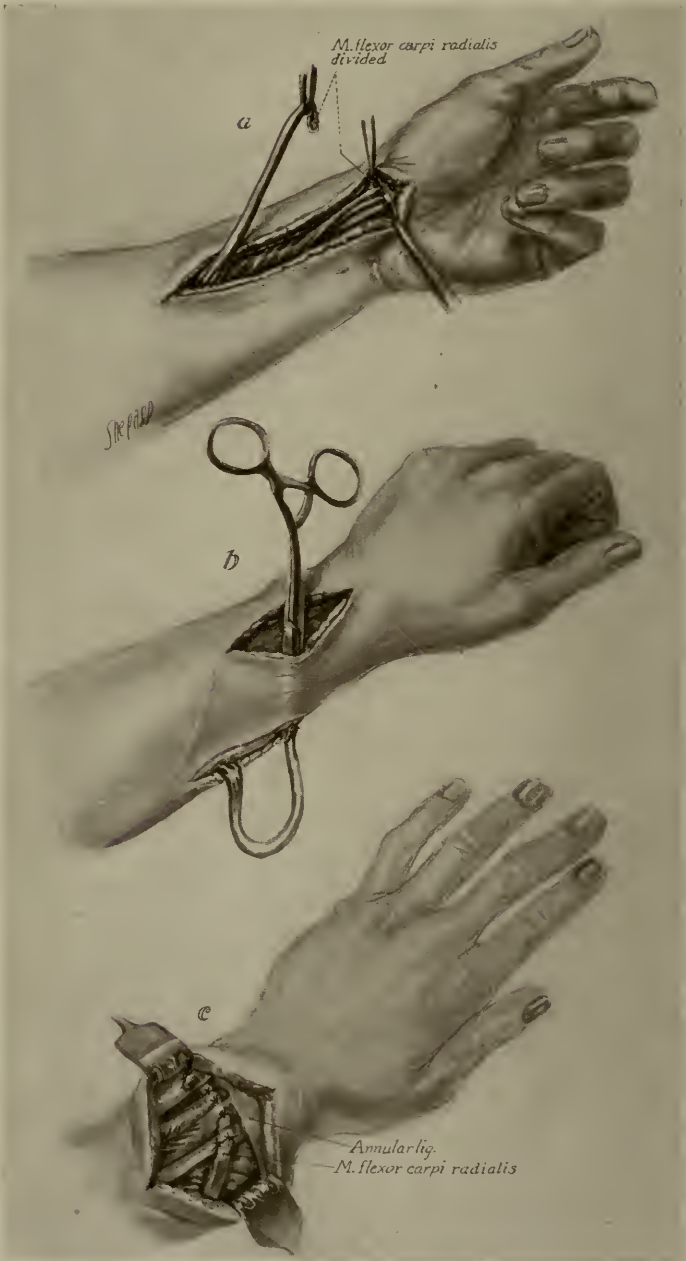
M. flexor carpi radialis
divided
a
Shepard
b
c
Annular lig.
M. flexor carpi radialis

Fig. 116.

spiral nerve we will have little difficulty in bringing the ends together, provided we place the forearm in semiflexion. I have more confidence in obtaining improved function by the transplantation of the tendon than I have from the suturing of the nerve, and I shall, therefore, do the tendon operation first.

The patient is now etherized and I dissect out the insertion of the flexor carpi radialis tendon (Fig. 116, *a*) as far down on the wrist as I can. I extend my dissection up the forearm for about 5 or 6 inches, freeing the extensor tendon very fully for that distance. Turning the hand over, I now expose the extensor tendons of the wrist and fingers just above the posterior annular ligament. Taking a pair of curved artery forceps closed I burrow a tunnel in the superficial fat from the posterior incision to the incision on the anterior and outer surface of the forearm. Picking up the end of the flexor carpi radialis tendon in the artery forceps, I pull the tendon through this fat and connective-tissue tunnel (Fig. 116, *b*). I then split the extensors of the first and second phalanges of the thumb, the extensor of the index-finger, and the common extensors of the fingers, so that I can pass the flexor carpi radialis tendon through each one of these tendons and sew the flexor tendon with fine catgut suture in these extensor tendons (Fig. 116, *c*). I now close both wounds without drainage.

The next step of the operation will be the suturing of the musculospiral nerve. Flexing the forearm at right angles to the arm so as to bring the scars of entrance and exit close together, I dissect out the scar tissue and I find at once without difficulty the bulbous proximal end of the nerve. You will notice the nerve has a bulb on it about half the size of a cranberry. The distal end is found with a little more difficulty, but I now see the small distal end of the nerve coming into view in the dissection. It is separated from the proximal end by about $\frac{1}{2}$ inch of dense scar tissue which is adherent to the humerus. You will notice that

---

Fig. 116.—The tendon of the flexor carpi radialis is cut at its insertion, dissected from its bed (*a*), and drawn to the dorsum of the arm through a subcutaneous channel (*b*), to be passed through and sutured to the tendons of the paralyzed extensor (*c*).

the distal end of the nerve is curled down upon itself in the scar. Let me call your attention to the fact that in this dissection I am particularly careful not to pull the nerves with the dissecting forceps, and that I am dissecting the nerves out of the scar tissue here with the greatest care so as not to bruise or contuse them in any way. All my cutting is in the scar outside the nerves and my handling of the tissues is limited entirely to the scar tissue. I cannot too strongly emphasize the importance of this fact, because undoubtedly in some of the old operations for nerve suture surgeons did a good deal of damage to the nerve for some distance, because the nerve was pinched and grasped by tissue forceps and dissected out of the scar in that way. The modern method and the rational method is to very carefully leave the nerve alone and with a very sharp knife cut through the scar tissue about it so as to free it, but without doing it any injury.

Making a little tension on the proximal end and slight tension on the distal end, I can now overlap the two portions of the nerve so that I find that I can readily excise the bulbous proximal end, cut off the ragged distal end squarely, and yet have enough room to bring the nerve ends together and suture them without tension. As I dissect out the bulbous end, however, I am leaving a rather broad portion of the sheath of the bulb posteriorly and using this as a means by which I can place two tension sutures through this sheath and through the sheath of the distal end of the nerve. I am using very fine catgut for suture, and I have used altogether five catgut stitches in making a very good end-to-end approximation of the nerve (Fig. 117).

I am afraid that this operation has been very tedious, and yet it would be difficult to shorten it very much. You will notice we have been about an hour and a half in doing the tendon transplantation and the nerve suture and in applying the dressings. The arm is dressed in a large aseptic dressing and put up at right angles in a light plaster-of-Paris splint. I shall encourage the patient to attempt to move the fingers two or three days after the operation. It has been found in these tendon transplantations that early function is very desirable and does much to ensure a good result.

After-history.—Fortunately, the patient made an excellent operative recovery, the wounds healing by primary intention without reaction. I instructed him on the third or fourth day to attempt to extend the hand and fingers, and he was very much delighted to find that he could do this. I have encouraged him to continue active movements and passive movements of both hand and forearm, and at the end of a month he has very good extension of his hand and fingers, due, of course, not to the regeneration of the nerve, but to the tendon transplantation. I have informed him that at the very best it would take a year

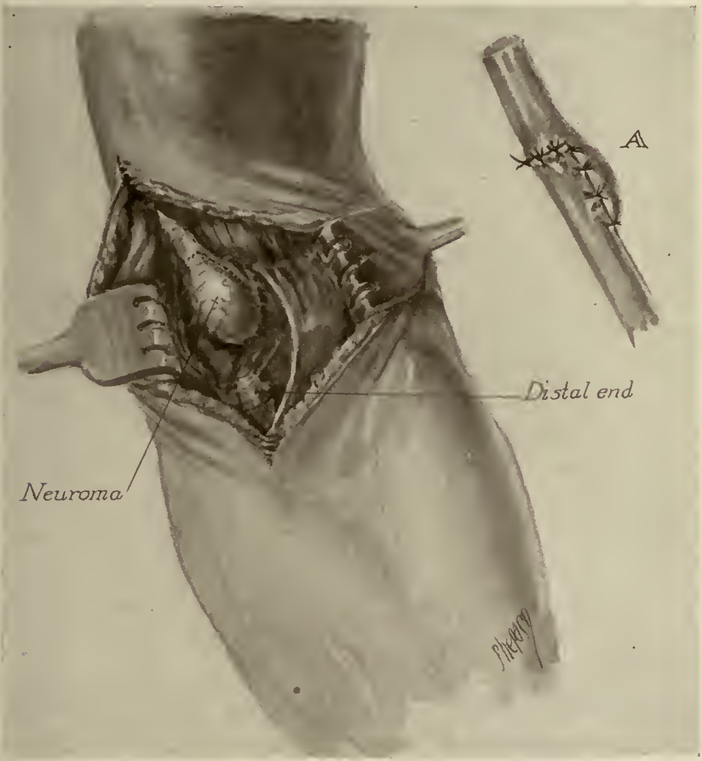

Fig. 117.—Nerve ends exposed. The dotted lines indicate the lines of incision for removal of cicatrix from the exposed ends. *A*, End-to-end anastomosis and utilization of portion of cicatrix to reinforce suture line.

for regeneration of the musculospiral to occur and that there is simply a fair prospect of this occurring.

The old statistics of these secondary sutures seem to give 30 to 40 per cent. of successful results. It is too early as yet to state with any certainty the statistics of the enormous number of cases of nerve suture that occurred during the war, but the general impression is that the results are somewhat more satisfactory than those furnished by the older statistics.

It seems to me that what we have done here is thoroughly sound and rational, and that we should in similar cases of musculospiral injury do the combined operation of tendon transplantation and nerve suture, the tendon transplantation, of course, offering the prospect of almost immediate improvement, and being, I believe, of value in maintaining the hand and fingers in the best possible position and maintaining the function of the joints, so that if regeneration does occur, we will find the muscles of the limb generally in condition where the recovery of the nerve supply will enable the patient much more rapidly to obtain motor control.

I would like to say one last word in regard to the operations for nerve suture in general, and that is this: From the large experience that was afforded to the war surgeons generally we seem to be coming to the conclusion that the one operation that offers hope, or any considerable hope, of nerve regeneration is direct nerve suture; that the various operations, such as transplantation of free nerve tissue or providing tubes of fascia or of other substances through which the nerve-fibers might regenerate for long distances, offer but very slight hope of benefit. It becomes our duty, therefore, to make every possible effort by free dissection, by stretching the nerve within safe limits, to secure greater length, and by dressing the limb in such a position that we can bring the nerve ends together without tension, to make a direct nerve suture. It is only in cases in which a direct nerve suture cannot be made by resorting to these various expedients that a more or less experimental nerve anastomosis, nerve transplantation, the use of tubes of fascia, and so forth, might properly be considered.

CLINIC OF DR. GOLDER L. McWHORTER

Presbyterian Hospital

PERINEAL ECTOPIA TESTIS

Summary: Perineal testicle with a small inguinal hernia in a twenty-one-year-old patient; orchidopexy, bilateral herniotomy.

This patient, I. F. W., twenty-one years of age, complains of a double inguinal hernia and a mass in the perineum, which pains him on pressure.

The patient has always had a small hernia on the left side. The one on the right side was first noticed after a fall on the sidewalk at the age of seven years. The right testicle is in the scrotum, but the left side of the scrotum is empty. The mass in the perineum, which has been present since birth, gives testicular sensation on pressure. It is evidently the left testicle. The patient has played basketball and wrestled, but says that on wrestling the perineal testicle often got caught between his thighs and pained him. He states also that his trousers often press against it, causing much discomfort.

There are three brothers, one paralyzed on the right side and one with an inguinal hernia. There are two sisters, one of whom was recently operated on by me for bilateral indirect inguinal hernia. The father has a double inguinal hernia.

On physical examination the general condition is excellent. The patient is of stocky build and well developed. There is a fairly large hernia extending into the right side of the scrotum and reducible with some difficulty. On the left side there is an impulse in the inguinal region on coughing and a small hernia palpable in the inguinal canal. The scrotum is empty on the left side, but apparently well developed, although somewhat smaller than the right side. A mass the size of the right testicle can be felt in the perineum back of the scrotum and just to the left of the midline. This mass is firmly fixed in the subcutaneous tissues, but its large size produces a prominence of the skin which can be readily seen (Figs. 118, 119). The examination is otherwise negative.

Operation.—After the usual inguinal incision on the right side just above the inguinal canal I find a congenital sac extending into the scrotum and continuous with the tunica vaginalis. There is a point of constriction at the internal ring. I am ligating the sac just above this point and removing it down to the region of the testicle. In this case I am removing most of the sac except the lower end, which I am suturing together somewhat as in an operation for hydrocele with eversion of the sac. I now replace the testicle in the scrotum and repair the inguinal canal after the method of Bassini, with the addition of the imbrication of the external oblique fascia.

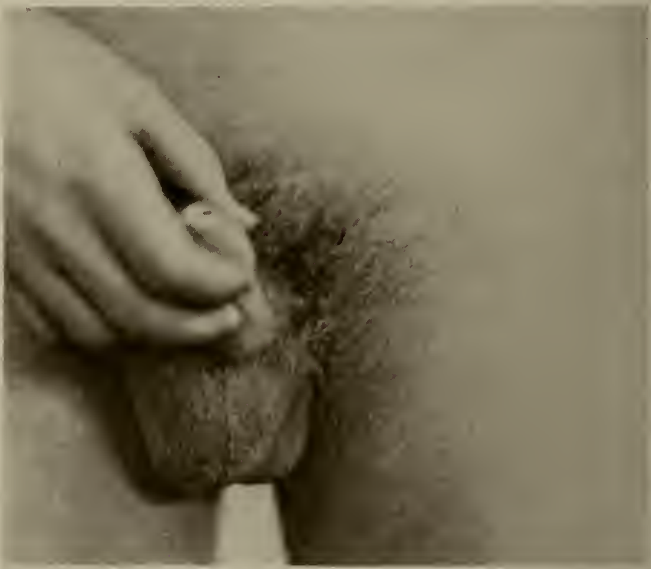

Fig. 118.—Before operation. The left testicle produces a bulging in the perineum behind the scrotum. The scrotum on the left side is developed, but is not so large as on the right.

On the left side I will make the same inguinal incision for the hernia repair and orchidopexy. I find on dissecting down upon the hernia that there is a small indirect sac which has at its termination the obliterated processus vaginalis. I am ligating the sac high up and dropping the stump back. Before repairing the inguinal canal I will remove the testicle from the perineum. I find it firmly embedded and difficult to remove on account of

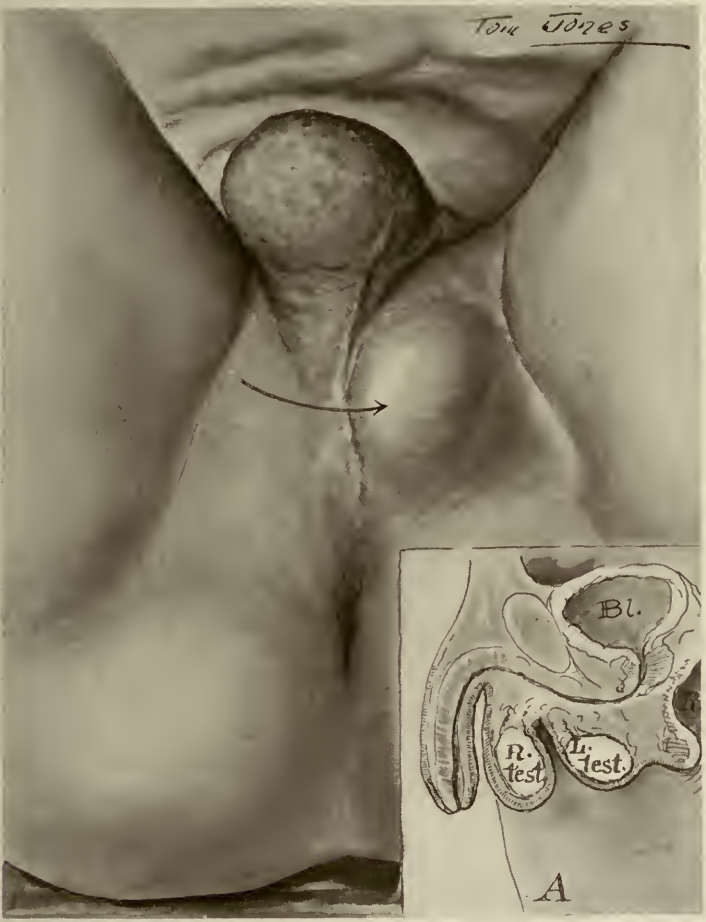

Fig. 119.—Perineal ectopia testis. 1 A, Anatomic relations of ectopic testicle in case demonstrated.

its large size. I am inserting my finger along the cord and stretching the tissues around it. The testicle is held quite firmly, due to its large size, but after some manipulation, with traction on the cord, I am able to withdraw it. I find it is perfectly free and without any attached bands. On attempting to insert my finger into the scrotum I find that there is a heavy layer of tough fascia preventing me from making a pocket there for the testicle. It is impossible to put my finger through this fascial layer. Consequently, I take hold of it with a hemostat, pull it into view by inverting the scrotum, force a second hemostat through the layer of fascia and spread out the opening. I now enlarge the opening with my finger and make a pocket below the fascia for the testicle. The opening in the fascia permits the testicle to slip through with difficulty, and I therefore feel certain it will not return to its perineal position. This makes suturing of the testicle to the scrotum or the insertion of a purse-string suture at the inlet unnecessary. I now repair the inguinal canal after Bassini's method, as on the right side, and close.

COMMENTS

The location of the testis in the perineum makes it incorrect to classify it as an undescended testis, as this implies the arrest at some stage in the normal descent, as in the abdomen or inguinal canal, before it reaches the scrotum. This is, however, an illustration of an imperfectly descended testis, or ectopia, where the descent has deviated from normal.

There are three chief forms of ectopia: First, the testicle is located near the root of the penis or subcutaneously above the inguinal canal. Second, the testicle is situated in Scarpa's triangle. In this type the testicle has occasionally passed through the femoral canal beneath the inguinal ligament. Third, the testicle is in the perineum. Many of the factors which may cause failure of descent of the testicle may be discarded as a cause of ectopia.

The two causes usually given for abnormal position, or ectopia, of the testis are: First, the testis may be drawn into an abnormal position by traction of certain fibers of the gubernaculum testis. Second, the testis may be pushed into its abnormal position by a hernia. The latter cause may be eliminated in this case, as the hernia on the side of the ectopia was only about the size of a walnut and did not extend outside of the inguinal canal. The processus vaginalis was obliterated up to the point of the hernial sac.

The gubernaculum testis is derived from a fold of peritoneum covering the wolffian body and extends in early embryonic life from the lower pole of the primitive kidney to the inguinal region. Later the gubernaculum transfers its upper attachment to the lower portions of the testicle. Both smooth and striped muscle-fibers appear. At the sixth month the gubernaculum, accompanied by a process of peritoneum, descends through the inguinal canal. The gubernaculum finds its lower main attachment at the base of the scrotum; however, fibers also find attachment in Scarpa's triangle, the perineum, about the root of the penis, and toward the anterior superior spine of the ilium. The fibers which terminate in the perineum may terminate by the side of the anus, blend with the external sphincter, or be attached to the ischial ramus. Usually the gubernaculum fibers disappear two months before birth.

There are several conditions of the gubernaculum which might produce variations of normal descent:

1. Deficiency or absence of the scrotal attachments.
2. Deficiency in the activity of its muscle-fibers.
3. Deficiency in its upper attachments.
4. Predominance of muscle and connective-tissue fibers attached to points other than the scrotum.

It is disputed whether the gubernaculum assists in the descent of the testicle by active muscle contraction, cicatricial contraction, or whether its rôle is a passive one. It is true in ectopia of the testis that these abnormal positions correspond fairly closely to the lower attachments of certain fibers of the gubernaculum. In some animals the testes are normally in the perineum, and perineal ectopia, as well as other forms of ectopia, where the position is normal in certain animals, may be a reversion to type.

Trauma may be a third cause of ectopia. In such cases the testicle may have been at one time in its normal position in the scrotum. This is best illustrated in a case of Steinmann's in which a seventeen-year-old boy first noticed the testicle in the perineum after being hit by a snowball when fourteen years of age. Trauma from an ill-fitting truss might also produce this type of ectopia, especially in a patient with partially descended testis.

As a fourth possible cause of ectopia I wish to suggest variations in the anatomy of the superficial fascia, especially the overgrowth of modified superficial fascia of the scrotum or tunica dartos. In this case I found a very thick, dense layer of fascia which stretched across the path leading into the scrotum and may have been the cause of the deflection of the testicle from its normal path of descent. This was perforated with difficulty and an opening large enough to admit the testicle made.

The scrotum is developed independently of the testicle, the cord, and its coverings. There are two chief layers of the scrotum—the skin and the modified superficial fascia or tunica dartos. The latter is a layer of fascia distinguished usually by the presence of numerous longitudinally disposed bundles of involuntary muscle-fibers, elastic tissue, and the absence of fat. This is connected with the fascia penis and fascia superficialis of the abdomen, thigh, and perineum. It is continued in the median plane as the septum scroti and so separates the spaces usually filled by the testicles and cord. In this case there was no remnant of gubernaculum holding the testis in the perineum, as we often see attached to the base of the scrotum. It seems logical to consider the resistant fascia of the scrotum as deviating the testicle from the scrotum in its descent. The resistance along the plane to the perineum may be less than that to the scrotum in some cases due to variations in the fascia and perhaps to the lack of development or overdevelopment of certain fibers of the gubernaculum associated with it. In the case demonstrated the testicle was embedded in the soft parts, with absolutely no evidence of any fibers attached to the testis, the tunica vaginalis, or the cord.

Evidently remains of the gubernaculum are present in many cases, as Eccles states that usually the testicle is tethered in the perineum by a firm band of tissue. He believes this is the remains of the gubernaculum which has succeeded in drawing it into its abnormal position.

The influence of heredity has rather been disregarded lately, although in the family of this patient there were three children and the father with inguinal hernias.

Perineal ectopia of the testis is a rare condition. In Eccles' series of 936 instances of imperfect descent of the testicle, 5 only were in the perineum. Coley states that at the Hospital for Ruptured and Crippled during eighteen years there were 737 cases of undescended testicles, 15 of which were of the perineal type. In 6 of these no operation was done. Hutchinson and Ammon each reported a case where both testicles were in the perineum. Curling in 1857 gave a description of 9 cases of perineal testicles, one of which was operated on with an unfortunate result. Monod and Terrieton in 1889 collected 30 cases. Klein collected cases up to about 1908 and reported cases of perineal testes bringing the number up to 81 cases. Coley has reported a number of his cases since then, and I have been able to find single case reports by McWilliams and Mulligan. I have been unable to get access to a case report by Simpson or to a small book written by Guegan on perineal ectopia.

Hernia accompanying a perineal testis is stated by Eccles to be seldom seen, although it accompanies more than one-half of all cases of imperfect descent of the testicle.

In this case, while a hernia was present, it was very small and could have had no influence in pushing the testicle into the perineum. However, on the opposite side, where the testicle was normally placed, there was a congenital hernia present, with abdominal contents extending down into the scrotum. This illustrates the associated lack of development of the adnexa.

The size of the testicle when located in the perineum is usually normal, but may be smaller than normal, as in Mulligan's case, where it was about one-half normal size.

The physiology of the testicle is not interfered with in perineal ectopia so frequently as in arrested descent, where only 1 out of every 24 testes is of normal size (Eccles). In this patient the size of the two testicles was apparently identical. No signs of inflammation or thickening of the tunica vaginalis were evident. The testicles were of rather large size.

Certainly the testicle when located in the perineum is more subject to trauma. In this case pain occurred on having the legs pressed together in wrestling, and irritation from the trousers pressing against the testicle was of frequent occurrence.

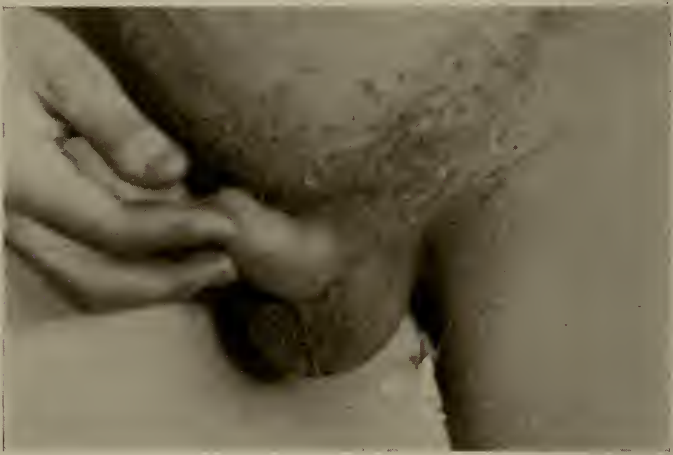

Fig. 120.—Twelve days after operation. The left testicle is in its proper position in the scrotum and fills it out, although there is no relaxation of the muscles in the scrotum or lowering of this side.

Postscript.—There was only slight ecchymosis of the scrotum on the left side, and two days after operation the patient stated that he had less inconvenience and pain from the testis than before operation. The wounds healed by primary intention, and the patient was permitted to be up on the tenth day and was discharged on the twelfth day. The testicle was then in excellent position in the scrotum (Fig. 120).

BIBLIOGRAPHY

Coley: The Treatment of the Undescended or Maldescended Testis Associated with Inguinal Hernia, Ann. of Surg., 48, 321, 1908. Ibid., 53, 844, 1911.

Eccles, McAdam: The Imperfectly Descended Testis, Wm. Wood & Co., 1903.

Guegan, H.: Ectopia Testiculaire Perineale, Montpellier, 1913.

McWilliams: Perineal Ectopia Testis—Case Reports, Ann. of Surg., 51, 729, 1910.

Mulligan: Case Report of Perineal Ectopia Testis, Proc. Royal Soc. of Med., vol. 6, Section of Diseases of Children, p. 193, 1912–13.

Odiorne and Simmons: Undescended Testicle, Ann. of Surg., 40, 963, 1904.

Sharp: Testicle in Perineum of Infant, Case Report, Brit. Med. Jour., 1, 16, 1903.

Simpson: Perineal Testicle, Med. and Surg. Rep. Episcopalian Hospital, Phila., 1914, II, 407.

Steinmann: Case Report of Perineal Testicle, Cor. Bl. f. Schweiz., 34, 397, 1904.

CONTRIBUTION BY DR. ROY L. MOODIE

Department of Anatomy, University of Illinois

PRIMITIVE SURGERY IN ANCIENT EGYPT

Summary: Paucity of evidence of surgical knowledge among ancient Egyptians—circumcision a common practice. Oral surgery indicated by a single example in the Old Empire, although diseases of the teeth were widespread and severe. The oldest known splints—similarity of the bark splints of the present-day Abyssinians—their function more that of protection to the wounded limb than of support to the fractured bones. Surgical instruments of metal and orthopedic appliances unknown in ancient Egypt. Trephining an undeveloped art. Earliest example of atheroma in ancient Egypt discovered in the aorta left by careless embalmers in the body of the Pharaoh of the Exodus. Some knowledge of surgical anatomy indicated by embalming methods in which the brain was sometimes withdrawn through the nose and the viscera through an incision at McBurney's point.

Civilization had its origin in and around the region bordering on the eastern and southern coast of the Mediterranean Sea, and in this early civilization the ancient Egyptians played an important rôle. When the first nomadic tribes wandered into the valley of the Nile we do not know, but present evidences indicate that Egypt has been peopled for the last 12,000 years at least and doubtless longer. Active investigations of the Pleistocene and recent deposits of the Nile valley will establish something of man's antiquity in this region. The earlier periods of Egyptian history, prior to 4000 B. C., are usually spoken of as *predynastic,* and this era covered at least 6000 years. Predynastic embalming consisted of wrapping the body in coarse cloth and burying it in the sand of the desert. The surgical procedures were developed after the period of the First Dynasty, and are first indicated in the Fifth Dynasty, 2750–2625 B. C.

When or why the ancient Egyptians first undertook the minor surgical procedure of circumcision is not known. In a tomb of the ancient empire (XIIth Dynasty, 2000-1788 B. C.) are depicted several figures of a primitive surgeon in the process of circumcising a youth with a sharp-edged flint knife.[1] From the fact that the bodies of boys eleven to thirteen years of age are found in the graves of ancient Egypt with the foreskins still intact it is assumed that the operation was not done until some time after puberty. In a prehistoric cemetery at Naga-ed-dêr all the male bodies were circumcised. The operation was doubtless similar to the one referred to in the book of Exodus (iv, 25), where Zipporah, the wife of Moses, "took a sharp stone, and cut off the foreskin of her son." This was before the passage of the Hebrews out of Egypt, and the Hebrews may well have acquired the ritual from the Egyptians, though present knowledge indicates that the procedure arose independently among the two peoples. Certainly archeologic evidences show that circumcision was practised in Egypt prior to the coming of the Hebrews, some centuries prior to the XIXth Dynasty, 1350–1205 B. C., during which the Exodus took place. It is known to be practised among the primitive negro tribes of Abyssinia, and there is no indication that they were influenced by either the Egyptians or Hebrews. An analogy is to be seen here in the surgical art of trephining which arose independently in western Europe and many centuries later in Peru.

The practice of dentistry in any of its phases has been shown by recent active investigations of many thousands of mummies removed from their resting-places prior to the erection of the Assuan dam to have been entirely unknown in ancient Egypt, although it is commonly stated that gold fillings have been seen in the teeth of ancient mummies. A single example of a mandible from the Old Empire (1500 B. C.) indicates that the primitive Egyptian surgeon may have attempted to drain an alveolar abscess in the right mandibular ramus (Fig. 121). Certainly the abscess was there, and two openings leading directly into it were made by some sharp-pointed tool to allow drainage into the vestibulum oris (Fig. 121, *a*). I have examined the mandible in the Peabody collections at Harvard University, and it seems clear that the deductions drawn by Dr. Hooten are correct, although it seems rather peculiar that in a people who suffered so terribly from alveolar abscesses, pyorrhea, and dental caries as did the ancient Egyptians there are not more indications of oral surgery. Many of the Pharaohs suffered tortures from toothache, and had there been any knowledge of dentistry, it seems certain, that holding the lives of their subjects in their

---

[1] The Egyptians early learned to work flint, and predynastic knives, beautifully designed and executed, with elaborately carved gold and ivory handles, are well known. Whether these were used in surgery is unknown, but the flints were probably not coarse.

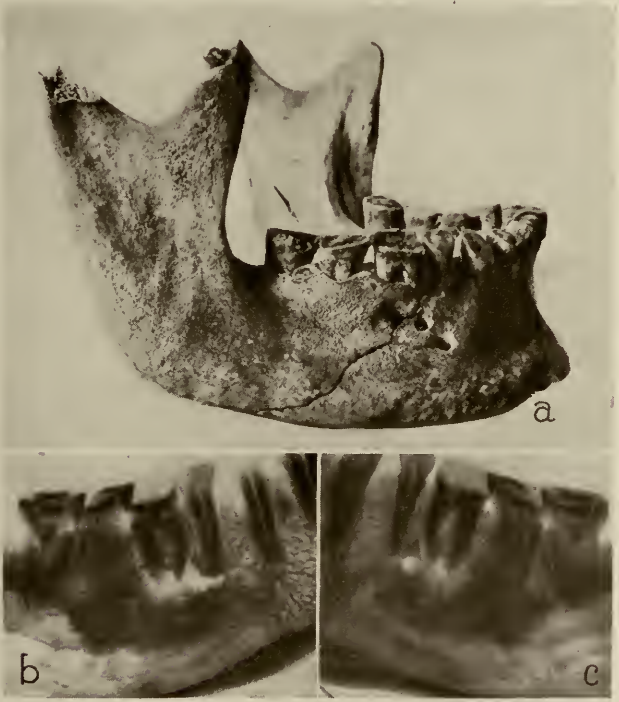

Fig. 121.—*a*, Mandible of an ancient Egyptian from an Old Empire (1500 B. C.) tomb excavated by G. A. Reisner at Giza. The specimen is from a middle-aged male of "The Giza Type." This jaw exhibits two perforations to drain an alveolar abscess and represents the oldest example of oral surgery. *b*, Radiograph of jaw from buccal surface. *c*, Radiograph of jaw from lingual surface.

hands as they did, they could have commanded some of their numerous attendants to lay a hand to the offending teeth and drag them from their moorings; but such seems not to have been the case.

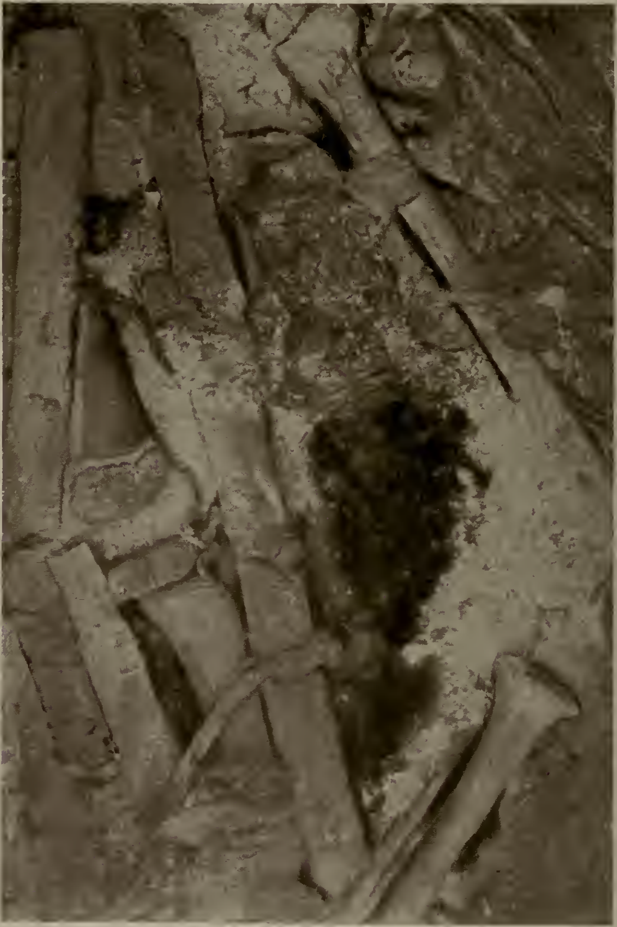

Fig. 122.—Photograph of the most ancient splints as found in position on the bones of a fourteen-year-old girl at Naga-ed-dêr, about 100 miles north of Luxor, Egypt.

Orthopedics also seems to have been entirely unknown to the ancient Egyptians, although there was abundant opportunity for its practice. Depicted on the walls of tombs and on stelæ and in the skeletons themselves are seen a variety of orthopedic disturbances, such as *talipes equinus*, possibly due to anterior poliomyelitis, *genu recurvatum*, figured on the wall of an ancient tomb, and possibly due to the kick of an ox, since many of these peoples were shepherds, and a great variety of spinal disturbances

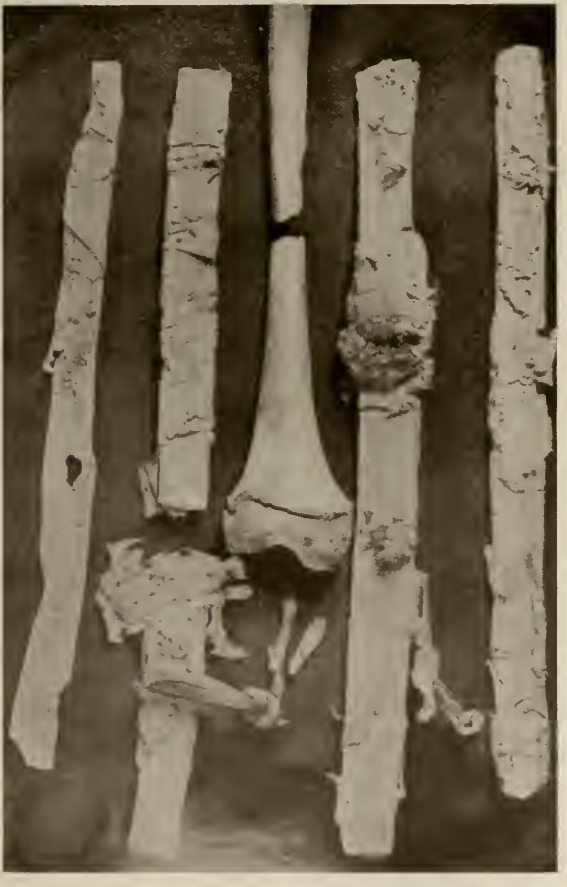

Fig. 123.—The same splints removed from the tomb, cleaned, and placed alongside the fractured femur. Note especially the pad of cloth wound around the splint to the right of the fractured femur. The reef knot was used in tying the bandage around the rough wooden splints. The remainder of the cloth had disintegrated.

which might have been benefited by the application of orthopedic appliances. Some of the ancient Egyptians were so terribly afflicted with joint lesions that for years prior to their death they were totally unable to move or turn their bodies, and must have been a constant care to their relatives.

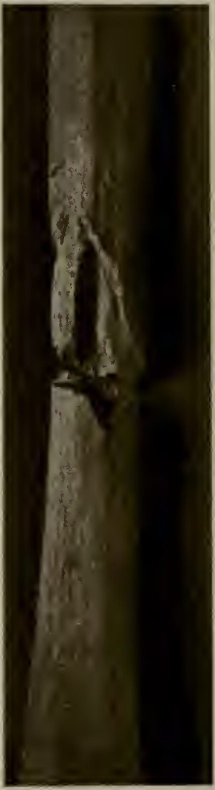

Fig. 124.—The fractured femur seen from behind, showing loss of substance and nature of compound fracture.

We are chiefly indebted to the studies of G. Elliot Smith for our knowledge of the most ancient splints. He has given a most careful account of them,[1] and the information given here is taken from his descriptions, and I have copied some of his figures. A set of splints (Figs. 122, 123) used in a compound fracture of the femur seen on the limb of a girl fourteen years of age, whose body was found in a rock tomb at Naga-ed-dêr, about 100 miles north of Luxor, dating from the Fifth Dynasty (2730÷2625 B. C.), is described as consisting of four splints, which formed a sleeve or tube around the entire limb, and in nowise prevented shortening of the limb or held the ends of the bones in place. The shortening of the limbs seen in fractured bones is of very common occurrence among the ancient Egyptians, union often being accompanied with the formation of considerable callus and deformation of the bones (Fig. 128). The

---

[1] G. Elliot Smith: The Most Ancient Splints, Brit. Med. Jour., 1908, i, pp. 732–738.

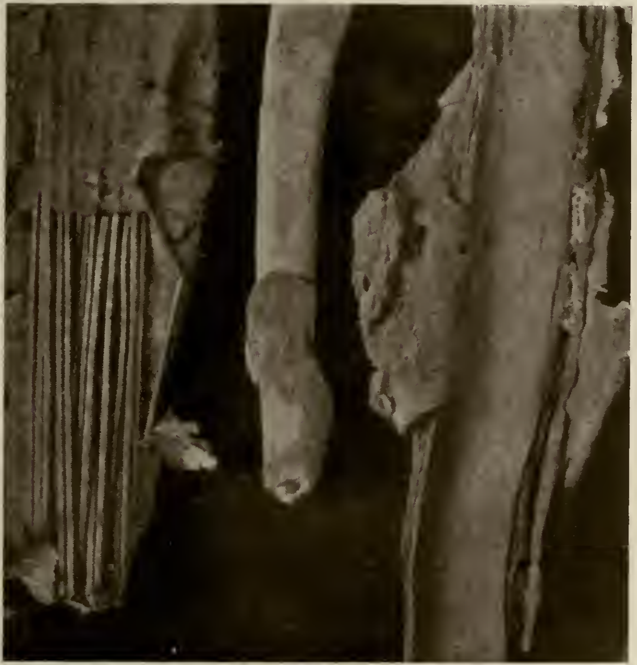

Fig. 125.—A primitive set of splints showing the use of palm fiber. The mass of palm fiber adhering to the ulna was introduced to absorb the blood and stop hemorrhage. On the right is a bark splint with blood-stained fiber adhering to its linen wrapping. On the left is one end of a bundle of grass reeds supported front and back by linen.

splints, in the present case, were made of rough unplaned wood, cut especially for the purpose, and roughly adapted to the form of the limb. The strips were wound round with linen and tied firmly to the limb by two reef knots (Fig. 123), above and below the knee. On the wound, through which the broken end of the femur (Fig. 124) had protruded, is placed a wadding of linen produced by wrapping a piece round and round the splint, and on this was placed a neatly folded bit of linen stained with blood, evidently placed there for the absorption of the extravasated blood.

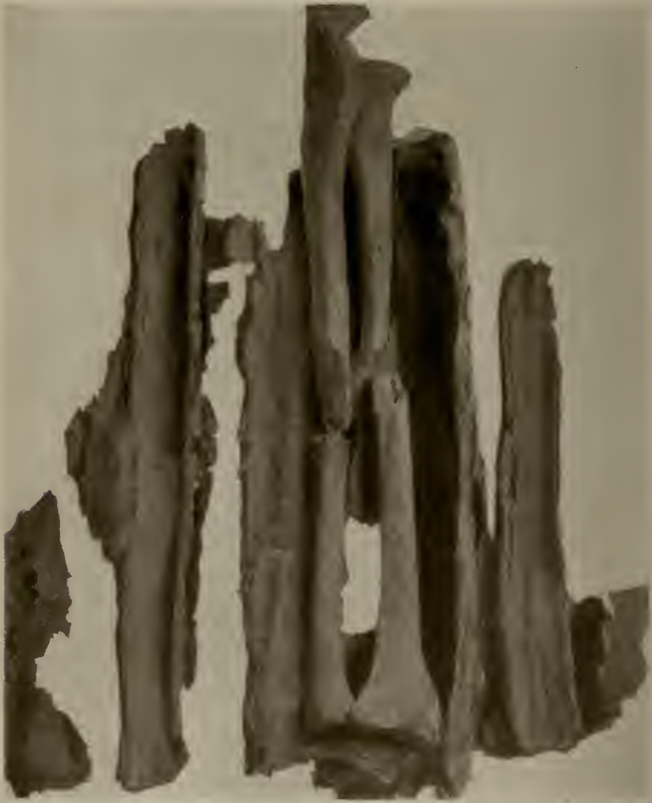

Fig. 126.—Fracture of left forearm set with bark splints with blood-stained vegetable fiber for absorption of blood.

Another set of splints (Fig. 126) was applied to the forearm in a case of compound fracture of both bones of the left antebrachium. There is a pad of fiber, evidently from the date palm, adherent to the fragment of the ulna, and its blood-stained condition indicates its use as a means of absorption. The splints consist of three pieces of rough bark, arranged in the form of a tube completely around the forearm, strengthened by a bundle of coarse grass. Death ensued before healing set in, since the bones show no evidences of repair.

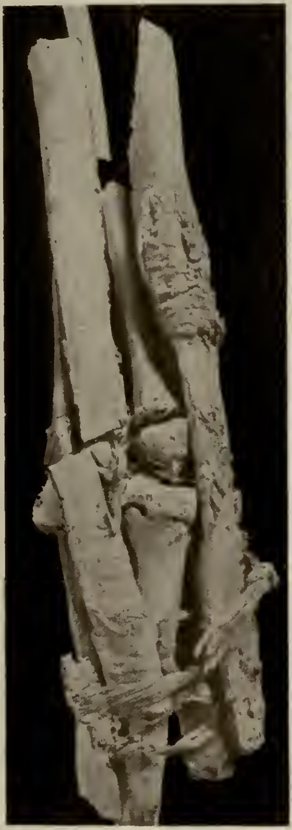

Fig. 127.—A set of ancient wooden Egyptian splints (5th dynasty) shown in position around a fractured femur.

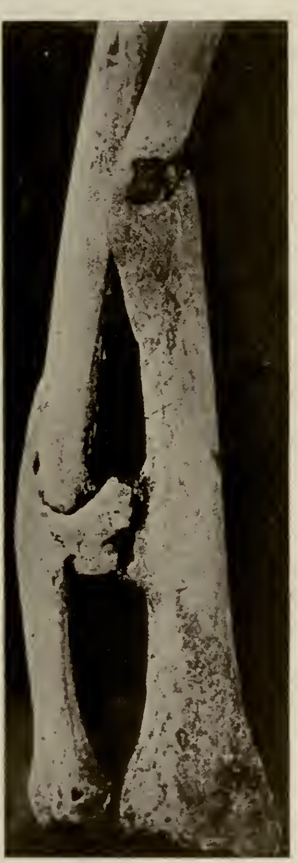

Fig. 128.—An example of vicious union after fracture of the forearm in a prehistoric Egyptian.

Similar splints are in use among the primitive people of Egypt today, and examples are seen in Abyssinia of splints which do not vary in their make-up from the primitive splints used in ancient Egypt five thousand years ago. In the remote villages primitive barber-surgeons or old women, who are adept, make a kind of mat of a number of pieces of palm-stick, laid side by side, in which they wrap the broken limb, so as to form a tube around it.

Although the practice of embalming the dead was in vogue for thousands of years in Egypt, it was only at a late period in ancient Egypt that there was any withdrawal of organs, the embalmers contenting themselves with wrapping the bodies in coarse garments and burying them in the dry, hot sands of the desert where desiccation accomplished the preservation. Later it became customary to withdraw all the organs of the body and even to remove the musculature and pack the body with pitch and sawdust, carefully modeling the original form of the body. To this care historians are indebted for an idea of the personal appearances of ancient Egyptian kings which are so beautifully depicted in the work of G. Elliot Smith on The Royal Mummies. The route followed in withdrawing the brain was through the nose, or *the pituitary route*, the removal being done with a blunt hook. The thoracic viscera were often left intact, though for a long period even the arch of the aorta was removed. To the careless neglect of the embalmers who failed to secure the aorta of King Merneptah, the Pharaoh of the Exodus, 1225 B. C., we owe our knowledge of *atheroma* in ancient Egypt. The abdominal viscera were withdrawn through an incision often made at McBurney's point, but occasionally the opposite side was used. The wound was closed after the removal of the viscera not by sutures, but by smearing with pitch. The pelvic organs of the female were usually left intact. After the organs were removed they were placed in Canopic jars and liberally smeared with pitch. The jars were then placed in the tomb with the individual.

CLINIC OF DR. CHARLES A. PARKER

Home for Destitute Crippled Children

CONGENITAL DISLOCATION OF THE PATELLA

Summary: Demonstration of the results of transplantation of the tibial tubercle in the treatment of dislocation of the patella.

This little girl is now eight years old and walks into the clinic without limp or apparent disability. She can stand on either foot with the corresponding knee in partial flexion without difficulty or mishap. We first saw her in April, 1919, when the mother stated that the right knee-cap dislocated whenever she bent her right knee and that the left had a similar tendency. When the child was four and a half years old the mother noticed that the right knee-cap was displaced toward the outer side of the joint, and later the left was observed to be following the same course. Walking was unsafe and falls were frequent, and accompanied by swelling of the joint as the patella jumped off of the condyles. An older sister, a victim of multiple arthritis, showed similar deformities of the knee, but as the arthritis was so severe as to preclude walking, dislocation was not observed at the time of the examination.

On examination, the right patella was observed to lie obliquely on the external condyle in extension and to slip entirely over to its outer side in flexion. The patellar tendon was apparently longer than usual. A roentgenogram confirmed the outward displacement of the patella, but did not disclose any other definite pathology. There was a slight knock-knee. At that time transplantation of the patellar tubercle with possibly a correction of the knock-knee was advised.

On July 15, 1919, under ether anesthesia, the following operation was performed: A transverse curved incision extending from the outer side of the tibial tubercle to the inner margin of

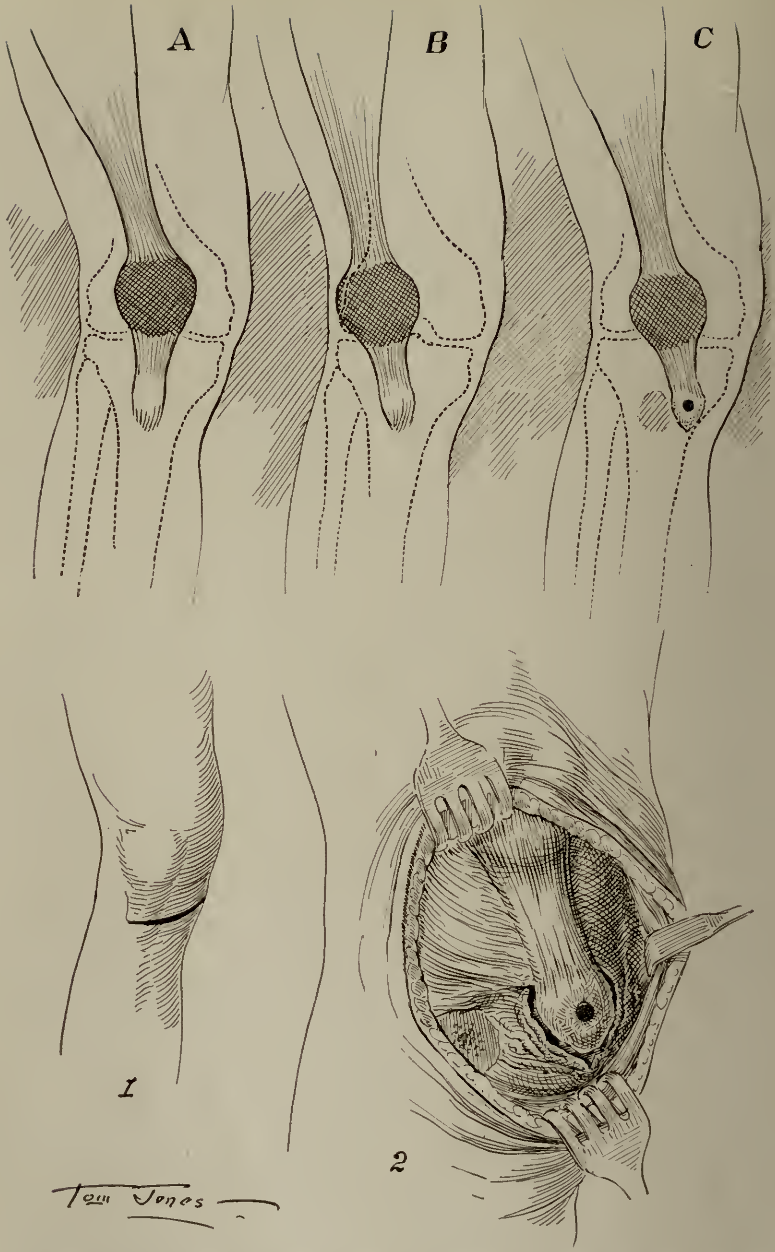

Fig. 129.—*A*, *B*, *C*, illustrate the mechanics of outward dislocation of the patella and the influence of inward transplantation of the tibial tubercle. 1 and 2, Details of the operation; the tubercle has been anchored in position with a nail.

the tibia was made through all tissues down to the bone. The tibial tubercle, with the attachment of the patellar tendon, was then chiseled away from the tibia and displaced inward close to the inner border of that bone, and through a split in the periosteum reimplanted and held in place with a flat-headed wire nail about 1 inch long. The tissues were then closed and a plaster cast applied (Fig. 129).

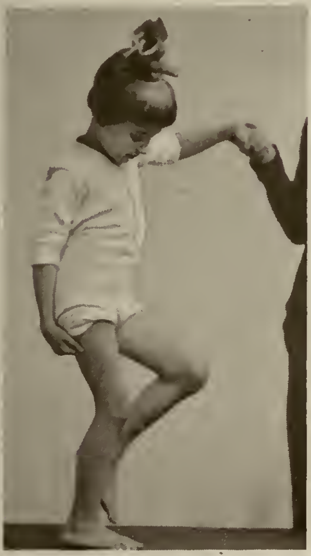

Fig. 130.—Patient after operation, standing on either leg with knee bent without dislocation of the patellæ.

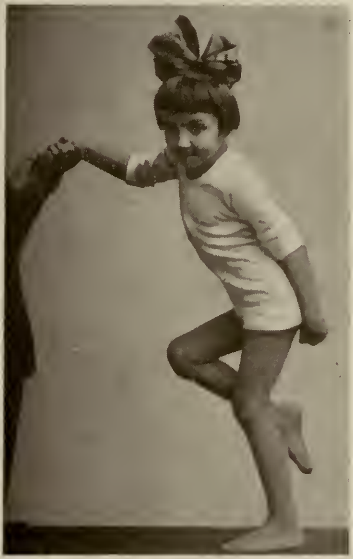

Fig. 131.—For legend see Fig. 130.

A similar operation was performed upon the left leg and a cast applied to that one also. The legs were left in casts ten weeks, when the casts were removed and walking resumed. Although according to the clinical and x-ray evidence the right patella in the resting condition is still displaced laterally, it does not dislocate. The left shows no evidence of displacement (Figs. 130–132).

On July 25, 1919 I operated upon a somewhat similar case in a fourteen-year-old girl at the Presbyterian Hospital. The dislocation had been so frequent and so painful in one leg that the patient wore a cast for several months previous to the operation to relieve the pain and swelling of an arthritis. In this patient both knees were involved and only the slightest tendency to knock-knee existed. The operation was in all respects similar to the one described and which I have employed in 3 previous cases (Figs. 133–135).

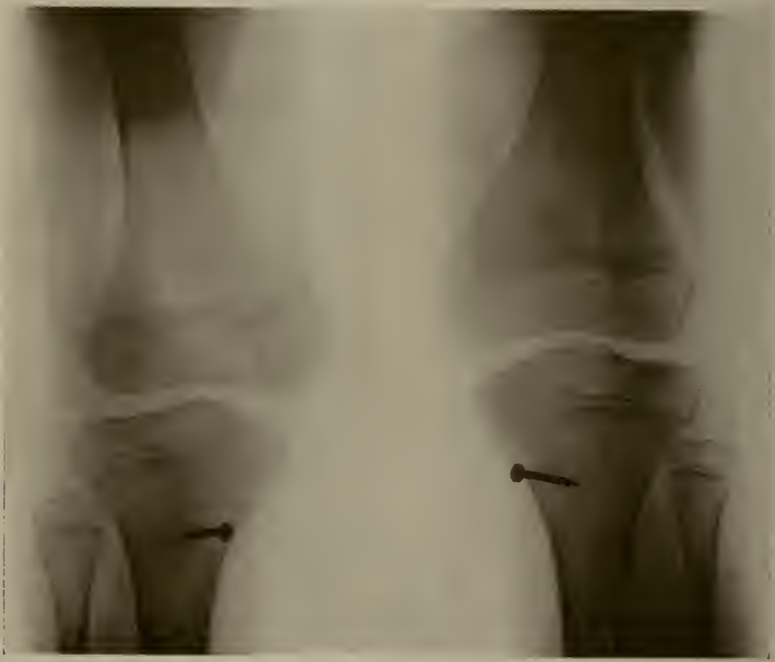

Fig. 132.—Roentgenogram showing outward displacement of the right knee-cap and the nails retaining transferred tibial tubercles. The heads of the nails show the new locations of the tubercles.

The time that has elapsed since these operations is too short to determine the permanence of the relief, but the results in 3 other cases similarly treated in 1911, 1912, and 1917, respectively, seen two or more years later, showed complete relief of the condition, with no dislocations after the operation.

The first case was that of an Italian girl twelve years of age in whom the left patella was dislocated outward every time the knee was bent to a right angle; in fact, it lay on the outer side of the condyle most of the time. She fell frequently and had special difficulty going up and down stairs. It was operated upon December 5, 1911.

In this case, the first one, the inner part of the joint capsule was plicated, besides transference of the tibial tubercle.

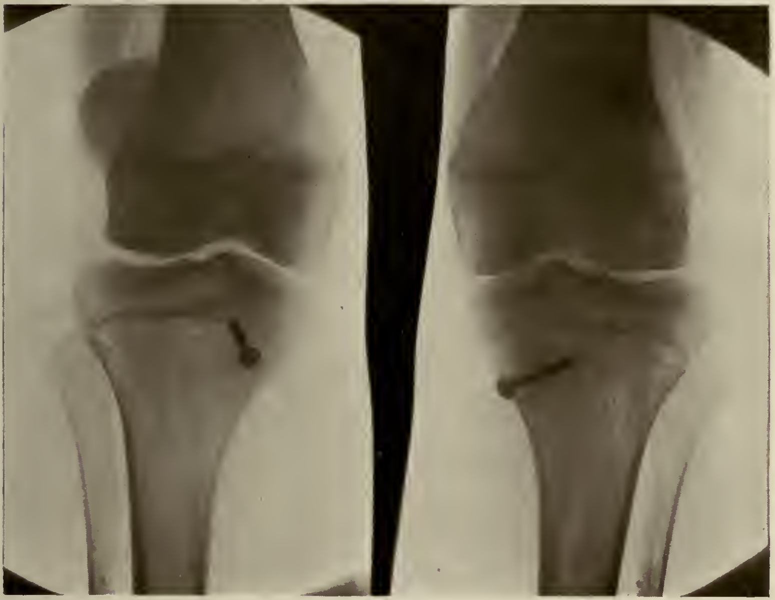

Fig. 133.—Roentgenogram showing outward displacement of the left patella with the nails in place after operation. The transplanted tubercle prevents dislocation from this extreme position.

The accompanying photo (Fig. 136) shows her ability to stand on the bent leg when examined about two years later. The patella could not be dislocated manually.

The second case was that of a girl eleven years of age who had recurring dislocation of the right patella. A sister also had a congenital dislocation of the hip. The dislocation of the patella was treated in the same way as the first one by transference of the tubercle and reuniting to the tibia with a nail. The capsule was not touched. A photo a year later shows perfect use of the knee and she has had no trouble with it (Fig. 137). This patient was seen recently and, although not examined, appeared to have no trouble with the knee.

The third case is that of a married woman thirty-five years old who first noticed her trouble when ten years old. Previous to her operation in April, 1917 she had several painful dislocations of her left patella, making her walking very uncertain.

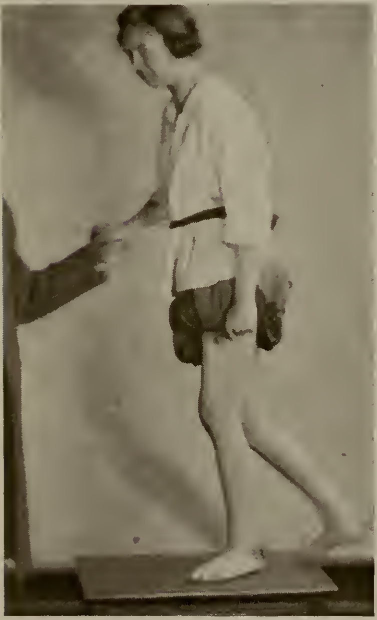

Fig. 134.—The patient is standing rather unsteadily on either bent leg as she was just recently out of the casts. Later the knees have become more stable. There have been no dislocations.

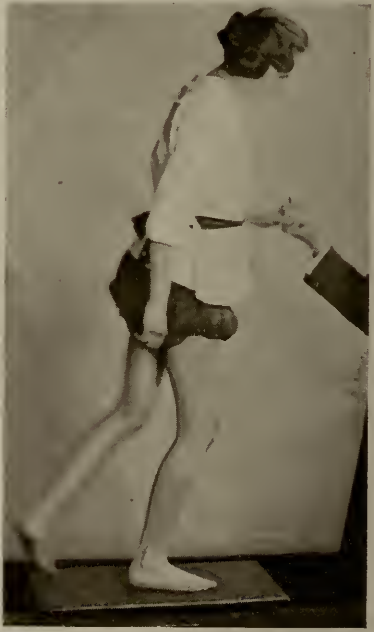

Fig. 135.—For legend see Fig. 134.

This was treated by the same operative method, and a recent report says she has no further trouble with the knee.

This method is ascribed to Roux, of Lausanne, and appeals through the simplicity and directness of its mechanics.

The dislocation is almost always outward and is due to a combination of circumstances favoring the displacement. The outer condyle is less prominent, the inner side of the capsule stretched, and the patellar tendon usually longer than normal. With the inward displacement of the tubercle and tendon the length of the tendon from its new insertion to its origin in the patella is not enough to allow the patella to be manually or otherwise displaced to the outer side of the external condyle.

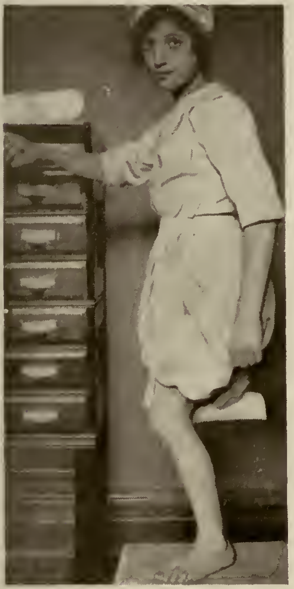

Fig. 136.—Patient standing on the bent leg two years after the operation.

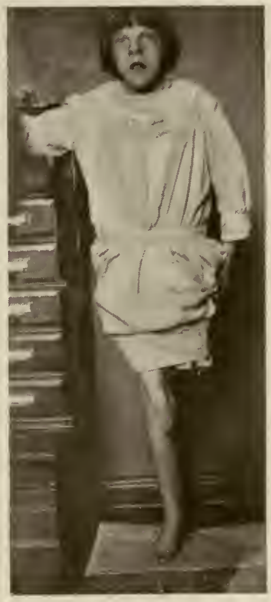

Fig. 137.—Patient standing on the bent leg one year after operation.

I have never had to correct the accompanying slight knock-knee observed in some of the cases. Extreme knock-knee is rarely accompanied by dislocation of the patella, and correction of the moderate knock-knee that may be present is usually not sufficient of itself to cure the dislocation. The nails have never caused any trouble and I have not had to remove any of them later. Should their removal at any time become necessary it could be done very easily.

CLINIC OF DR. KELLOGG SPEED

COOK COUNTY HOSPITAL

INGUINAL HERNIA

Summary: Operative technic adapted to anatomic findings in order to avoid recurrences. Use of the rectus muscle in conjunction with the conjoined tendon.

THIS patient has that common condition which brings us so often to the operating room—an inguinal hernia. As I open the skin over the inguinal canal and lay bare the external oblique we catch each bleeding point to avoid soiling the tissues with blood and to make the anatomic distribution clear. By cutting open the roof of the inguinal canal, which means splitting and separating the fibers of the external oblique muscle in the direction of its long fibers, we expose the cord and deeper anatomy of the inguinal region. At this point ceases also the *common* technic we apply to all inguinal hernias. I say that in spite of the fact that I use, most of the time, the Andrews imbrication operation for the cure of hernia, but, as its honored originator intended, we try to use such modifications of the technic as the individual's anatomy demands and we seldom do two successive herniorrhaphies in precisely the same manner as far as the abdominal muscles used in the approximation are concerned. Many surgeons have learned a technic for herniorrhaphy and they abide by it through year after year of practice, failing to employ useful adaptations of the anatomic material at hand in the operative field, and to improve their mental grasp of the performance of this common and necessary plastic operation.

We vary our technic because we think we have to; we hope thus to obtain the minimum of recurrences; the practical possibility of recurrence is emphasized for us because we are forced to reoperate so many times in this institution on the poor results obtained by a host of operators who seem to cling to herniorrhaphy performed by a hide-bound rule considered equal to any patient's necessity. It is not my intention today to go into the complete technical detail of the average herniorrhaphy which has been so ably described by Dr. Andrews himself in this clinic, but rather it is my wish to call your attention to points of variance as illustrated by this or any patient we incise for radical cure. No two are the same any more than the temperature curves of any two typhoid patients are the same, and, in a progressive spirit, let us examine this patient as we go along and consider the points his anatomy brings before us.

The inguinal canal has been opened by splitting the external oblique, and we believe, from the preoperative examination, that we are dealing with an indirect or oblique hernia. By any method one desires the sac can be identified and its isolation from the rest of the cord can proceed. We usually insert the index-finger beneath the cord just before it passes over the pelvic margin and lift it from its bed by separation of the tissues which furnish a natural plane of cleavage here. The sac of an indirect hernia is then seen or, if covered by cremasteric fibers, the fibers are incised in the long axis of the cord until the whole cord can be spread out fan-like so that its different tissues can be easily inspected. We find here a well-developed indirect sac 2½ inches long which can be stripped by means of gauze dissection from the remaining cord tissues composed of vas, vessels, cremaster muscle, and connective tissue. In only one place is the sac so adherent that it must be separated by a light knife stroke. This dissection is carried well up and beyond the orifice of the internal ring by making traction on the loosened sac. Before going further with the sac I will stop a minute to point out the surgical anatomy present (Fig. 138). At the under border of the sac neck you see plainly the two deep epigastric vessels, vein and artery. Under the lower flap of reflected external oblique muscle, at its insertion, is Poupart's ligament. Across the lower extremity of the wound opening is the pubic ramus. Along the inner side passes the rectus muscle in its sheath, and higher up we find the conjoined tendon with its red fibers passing across from their insertion into the rectus sheath over to Poupart's ligament, some 2½ inches above the pubic bone. This leaves a space of at least 2½ inches between the edge of the rectus and

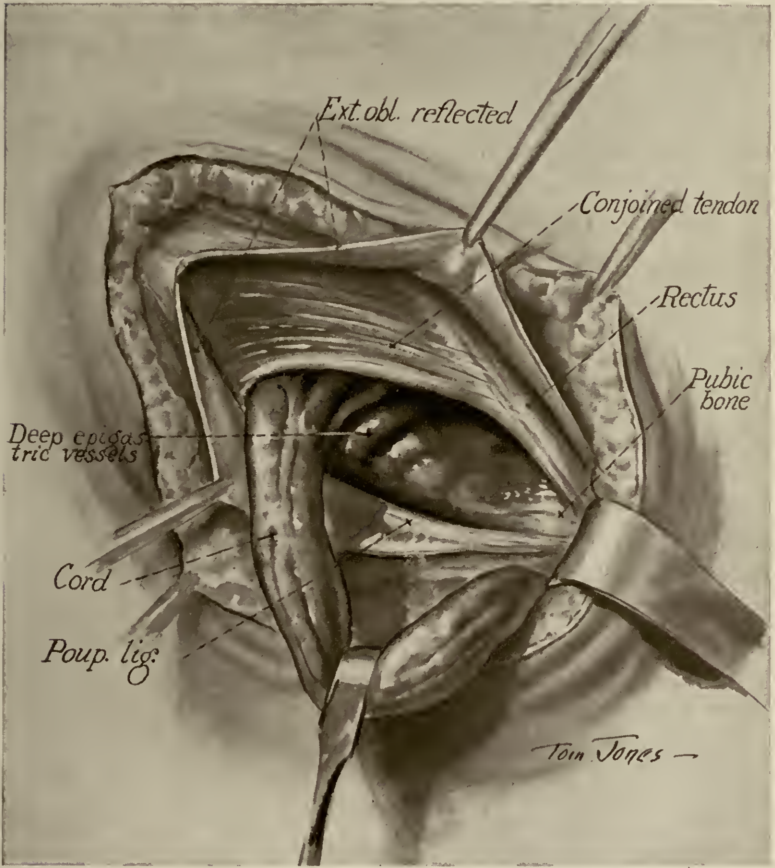

Fig. 138.—Surgical anatomy of inguinal canal in a case with marked deficiency of conjoined tendon.

Poupart's ligament, which has no firm muscle and fascia wall to hold back the abdominal contents. When I press on the abdomen above we can see a distinct bulging effect in this weak triangular area. The patient, then, has a distinct indirect hernial sac which has already been dissected free, and when we come to observe his anatomy closely we find that he has also a potential and already inaugurated hernial protrusion in the area of direct hernia which was not mentioned in the clinical history.

The muscular deficiency here is not determined in the absence of definite hernia by a bulging when the patient stands or an impulse on coughing, but by palpation of the examiner's index-finger through the invaginated scrotum into the external ring. If the conjoined tendon is deficient one finds little resistance at the external ring and the finger may pass in over the pubic ramus behind the rectus muscle. That is exactly the type of muscle deficiency we have in this patient. If it were equal on both sides in this case, fingers inserted into the external inguinal rings could meet behind the recti in the space of Retzius.

Shall I proceed now to ligate the sac high up after transfixion, remove any inguinal lipomata present,[1] and then take this very thin and high attached conjoined tendon and try to stretch it down to Poupart's ligament as in the routine Bassini operation? This brings us to the very point I mentioned after opening the canal—we judge each hernial region on its own anatomy and do not attempt to perform any fixed operation. No predetermined technic will fit every case. Some conjoined tendons are muscular, are attached low down on both the rectus and ligament side (Poupart's); others are thinner and attached higher, as in this patient; still others are completely lacking—there is no muscular conjoined tendon present in the area of hernia and no muscular tissue is found below the site of the internal ring at all, except the rectus toward the median line.

If there is this anatomic variation, how can we use a uniform operation for bringing the conjoined tendon to Poupart's ligament to effect repair? We cannot do so; and an analysis of recurrences after herniotomy should teach us the folly of such an attempt. We can ignore those recurrences caused by infection with sloughing of tissues and sutures. Let us consider the recurrences following clean operation. In the hands of good operators they are less than 1 per cent. Recurrence following herniorrhaphy occurs usually at one of two points. First, at the internal ring, and second, in the area described at the lower angle of the inguinal region above the pubic bone, through which we may thrust an examining finger.

---

[1] Speed: Surg., Gynec., and Obst., September, 1914, 373.

To avoid recurrences, then, we must consider these two spots minutely and determine in each and every herniorrhaphy which procedure in the plastic closure will give the least chance of return. Incidentally we must remember that herniorrhaphy is, in reality, a plastic operation in the performance of which an attempt is made to cover a weak spot which is subject to almost constant pressure and change of tension after the patient has been operated on and permitted to walk about. Consequently, we must give these muscular tissues which are applied to Poupart's ligament an opportunity to heal in their new position by adhesion of muscle to ligament to be able to bear these tensions without giving way. We must therefore keep these patients on their backs until this adhesion will hold—two weeks in bed for a double herniotomy is not too long, then two to four weeks of very careful walking and sitting before much freedom is allowed. That will help reduce the recurrences to some degree.

The main faults, however, lie in the closure of the points described at the upper and lower angles of the wound. Thorek[1] claims practically 100 per cent. of cures in 600 cases because, while he pays attention to closure of the lower angle of the hernial area, he puts much stress on the treatment of the sac neck. His advice is to separate cleanly the sac, blood-vessels, and vas of the cord, with removal of all connective tissue, so that when ligated the stump sac falls back into the abdomen between the vas, which comes out at the lower end of the opening in the transversalis fascia which we call the internal ring, and the cord blood-vessels which come out at the upper end of the opening. At the point on the intra-abdominal surface where these two cord elements meet at an angle he believes the infundibular-like protrustion of the peritoneum tends to cause recurrence. To obviate this he advises that two stitches for the union between muscle (conjoined tendon) and Poupart's ligament be placed

---

[1] Annals of Surg., vol. lxx, No. 1, 65.

between the points of exit of vas and vessels of the cord, separating them by a muscular wall which blocks off the tendency for a funnel-shaped protrusion of the peritoneum. This may be a most valuable procedure in some instances, but it often involves more dissection than is needed and exchanges two points of exit for one of vas and vessels combined. It is our custom to dissect the sac high up and tie it high and then make the internal ring closure snug enough to warrant little chance for subsequent peritoneal protrusion. It has been my experience that but a small percentage of recurrences come from this area and the cause described. Bloodgood[1] also believes that recurrences from the upper angle are in the minority, are small, and rarely lead to secondary operation. He favors Halstead's idea of excising the veins of the cord to reduce its size, *i. e.*, to make a snugger internal ring. We must consider the use of this permanent separation by muscle suture of the vas and cord blood-vessels at the internal ring for some cases, rare ones in our experience, but we must always cling to a snug closure of the internal ring.

The second point of weakness at the lower angle of the hernial area is the most important. It is on that account that our herniorrhaphy must not be according to rule, but according to the anatomic findings. We must make it a hard-and-fast rule to suture muscle to Poupart's ligament *all the way down to the pubis*, so that recurrences of *direct* type may not follow. You understand that I mean to say that the recurrence following an *indirect* hernia may be a direct hernia because of this omission. We find it so in the clinic frequently.

The position for the cord by transplantation or non-transplantation has little bearing on the lower angle recurrences provided the rule of muscle closure down to the pubic bone is adhered to.

If the conjoined tendon, as in this patient, is deficient; if there is a space 2½ inches across between Poupart's ligament at its insertion into the pubic bone and the lower edge of the conjoined tendon, this cannot be bridged safely and securely by attempting to draw the muscle down in any of the ordinary types of herniorrhaphy. When the conjoined tendon lies so high it is usually deficient in quality as well as quantity, and its thin fibers will not stretch out to cover any great deficiency. It is not a sutural defect which causes recurrence in these cases as much as it is a muscular defect. The conjoined tendon does not furnish enough muscle to suture to Poupart's to cover this weak area, and if improper protection by muscle plastic is given this lower angle we can look for recurrences of the direct type.

---

[1] Annals of Surg., lxx, No. 1, 81.

We must, consequently, obtain suitable muscle covering for this area. If we free and mobilize the conjoined tendon from its insertion into the rectus sheath to bridge too large a gap we injure its anchorage and defeat our intention of muscle covering just as much as if we stretch the muscle until its fibers separate. In operations for recurrent hernia we too frequently find the conjoined tendon obliterated or so deficient that it has no plastic value; then we *must* have recourse to the rectus. If we use the rectus more in the first place we surely will have fewer recurrences.

Halstead first advised opening the anterior rectus sheath near the edge to expose the muscle-fibers for use. Some operators condemn this method, because a small opening which would not interfere with the insertion of the conjoined tendon into the rectus sheath would not permit the escape of sufficient rectus fibers to close the deficient area. If the sheath alone is used, that procedure can be questioned because at this low level of the rectus there is no posterior sheath, and the cut edge of the sheath freed anteriorly has no anchor in the linea alba to draw upon. Consequently, from an anatomic viewpoint it is best to use the whole rectus, sheath and all, drawing it over to Poupart's ligament firmly (Fig. 139). We never use non-absorbable sutures here, that is a matter of personal choice we believe, and results with kangaroo tendon are reliable. The approximation of conjoined tendon and of rectus, where it is needed, must be clean and firm and not under such great tension that stitches will pull through. Under no circumstances must there be interlying

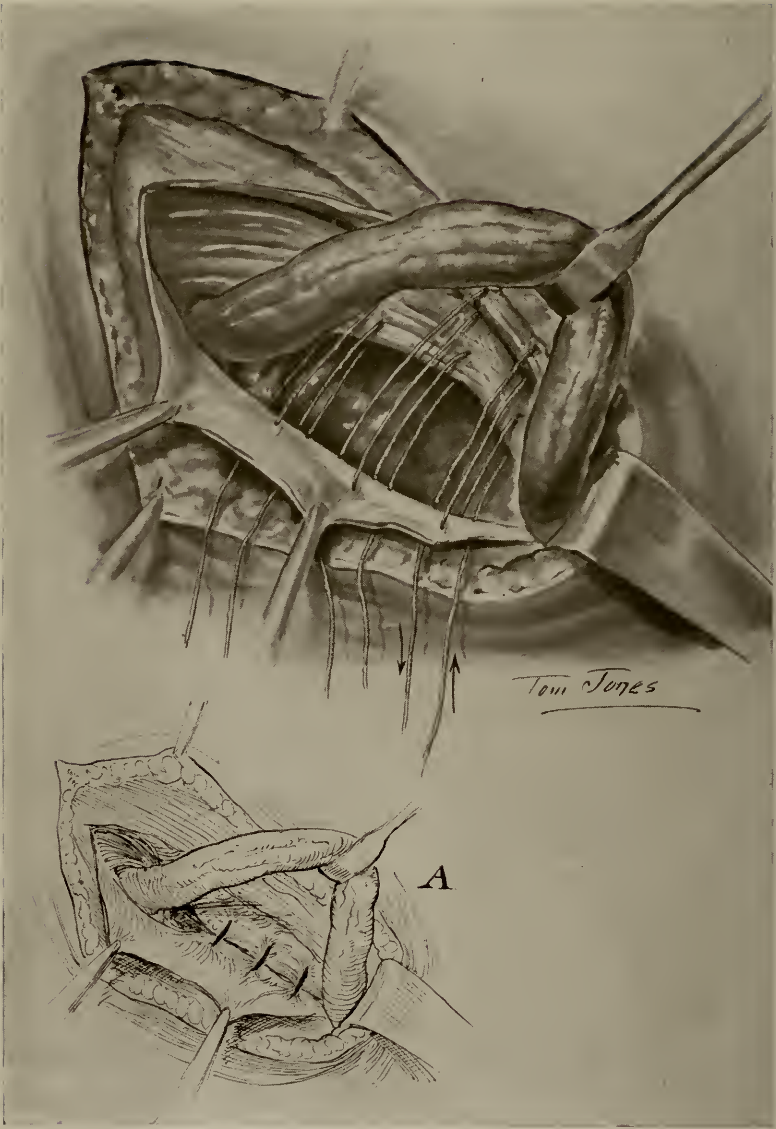

Fig. 139.—Method of closure of inguinal canal with actual or potential direct hernia, utilizing rectus muscle with its sheath to form the lower portion of the new posterior wall. The sutures are introduced (see arrows) in such a way as to imbricate external oblique aponeurosis over conjoined tendon and rectus. *A*, Snug closure of defect resulting when sutures are tied.

fat, connective tissue, or cremaster muscle from the cord between the surfaces brought together by our plastic.

We rarely excise the veins of the cord unless they are quite bulky or varicose. Hydrocele from vein excision seems improbable. I have never seen it, but I have seen it following ligation of the distal portion of an unobliterated tunica vaginalis testis in a congenital hernia. In that type we either leave the lower portion of the sac around the testis wide open or, better, turn it completely inside out around the testicle, as in the bottle operation for hydrocele.

There are no unalterable rules about cord transplantation. Usually we do not transplant the cord when there is a good conjoined tendon which is firm and can be mobilized without severing the insertion to the rectus, so that it can be drawn to fit down to Poupart's ligament and the pubic bone; then we leave the cord in its bed after sac disposal if the hernia is indirect. In such findings, of course, there would be absolutely no need of utilizing the rectus muscle.

In direct hernia I usually transplant the cord—because we have a deficient conjoined tendon. Likewise—when the weakness at the lower angle of the inguinal area is caused by obliteration of the conjoined tendon or when this tendon cannot be properly mobilized to furnish complete covering and the rectus must be used—then the cord is transplanted. A firm wall of muscle then lies beneath the cord, extending to Poupart's ligament and down to the pubic ramus, through which hernial protrusion can occur in but rare instances, as there is no cord seeking exit at that point to weaken the line of approximation.

CLINIC OF DR. DAVID C. STRAUS

COOK COUNTY HOSPITAL

SUBDIAPHRAGMATIC ABSCESS—TRANSPLEURAL DRAINAGE OF A CASE DUE TO ABSCESS OF THE LIVER

Summary: Etiology, differential diagnosis, and pathologic anatomy of subdiaphragmatic abscess. Tropical liver abscess—diagnosis; relation to subdiaphragmatic abscess. Treatment. Surgical anatomy and technic of operations for drainage. The perpleural route. End-results.

THE patient about to be operated upon came to our service transferred from the Medical Service of Dr. Ludwig Loeb, with the diagnosis of abscess of the liver. He is a white male, aged fifty-two years, married, and a clerk by occupation. He entered the Cook County Hospital September 11, 1919. The complaints that caused him to come to the hospital were: pain in the chest and abdomen, cough, shortness of breath, jaundice, and clay-colored stools.

He was in good health up to one year and a half ago, when he went to Central America, and there developed malaria and, a few weeks later, amebic dysentery. He had severe diarrhea with tenesmus and blood in the stools. After being treated by several injections of emetin he was apparently cured. About two months later he returned to Chicago, and here gradually developed jaundice, accompanied by no pain, but with a feeling of weakness, malaise, and uneasiness. This attack of jaundice lasted about six weeks and then completely disappeared. Being then apparently well, he returned to work until six months ago, when the present condition began.

About six months ago he developed pain in the right upper quadrant of the abdomen, associated with chills, fever, and sweats. The chills subsided several weeks ago, and are not now present, but the pain and fever have continued and are now the same as at the time of onset. The pain is dull in character, is constantly present, does not radiate, and does not seem to be influenced by rest, exercise, eating, or bowel movement. It is made worse by pressure over the lower costal border. It is so severe that it prevents him from sleeping. Cough developed about the same time as the abdominal pain—about six months ago—and has persisted; a dry, hacking, unproductive cough, present chiefly at night when he lies down or when he takes a deep inspiration. About six weeks ago he developed pain in the thorax, over the right apical region. This is still present, is continuous, sharp, and is not influenced by breathing. Jaundice associated with clay-colored stools developed about fifteen months ago, lasted about six weeks, and then suddenly disappeared. He has had a somewhat jaundiced look again since the onset of the present complaint. There is also gradually increasing weakness and emaciation. Shortness of breath has developed recently.

His previous history shows that he had gonorrhea and herpes progenitalis twenty-five years ago, but he denies ever having had a chancre or any other evidence of syphilis. He has a wife and 5 children, all living and well, and there is no history of any miscarriages. A Wassermann test, done while he was on the medical service, gave a negative result. Except for the usual diseases of childhood, there is no history of previous disease except the malaria and amebic dysentery already mentioned. He drank heavily of whisky, wine, and beer until a few years ago, when he reformed. He abstained until six weeks ago, when, after indulging in an excess of whisky, he developed the pain in the right side, which is his chief complaint.

On entrance into the hospital he did not appear seriously ill, but his condition is getting progressively worse and he now looks very sick. Otherwise the physical findings have remained about the same. You will note the peculiar color of the skin, not a true icterus, but a more dirty, grayish yellow. This is characteristic of liver abscess. Head and neck show nothing abnormal except this discoloration of the skin and a slight subicteric hue of the sclera. Examination of the chest shows nothing abnormal except that liver dulness extends abnormally high, both anteriorly and posteriorly, and I shall speak of this in detail in a moment. Vocal and tactile fremitus and breath sounds are diminished or absent over this area. Otherwise there are no abnormal areas of dulness, no râles, no increased fremitus, no bronchial breathing. The shortness of breath and cough are evidently the result of the extremely high position of the diaphragm which mechanically interferes with respiration. Examination of the heart shows the left border to be in the nipple line, the right border at the right sternal margin, and the base in the second interspace. There are no murmurs, no arhythmia, accentuated sounds, or rubs.

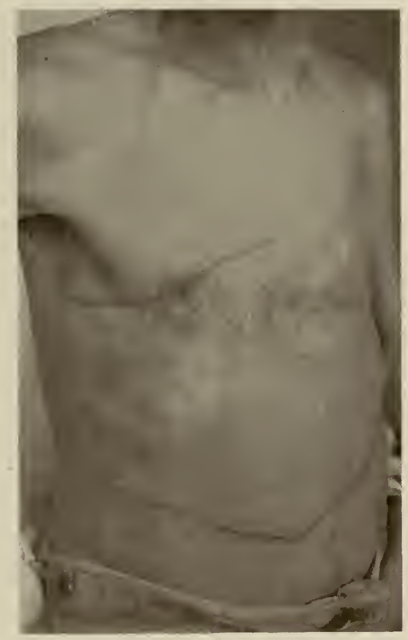

Fig. 140.—Outline of area of liver dulness on percussion. This reaches as high as the third rib, anteriorly. Photograph taken the day before the operation.

Abdominal examination shows tenderness over the liver and epigastrium, also over the lower portion of the chest on the right side, especially anteriorly in the region of the costal arch. There is fulness in the right upper quadrant apparently due to the greatly enlarged liver which can be plainly palpated, extending to the level of the umbilicus. Its surface is smooth and the consistency is firm. Percussion shows the upper border of liver dulness as I have it outlined on the patient's body (Figs. 140, 141). Diagrams and notes made in the records of the medical service show that they found them to be almost the same. You will note that the upper border of liver dulness reaches to the third rib, anteriorly, at the point where the liver dulness fuses with the cardiac dulness. Proceeding laterally, it curves gently downward toward the midaxillary line, where it is at its lowest, to rise again posteriorly, where it again arches upward in a gentle convex curve, the highest point reaching the fifth rib. The

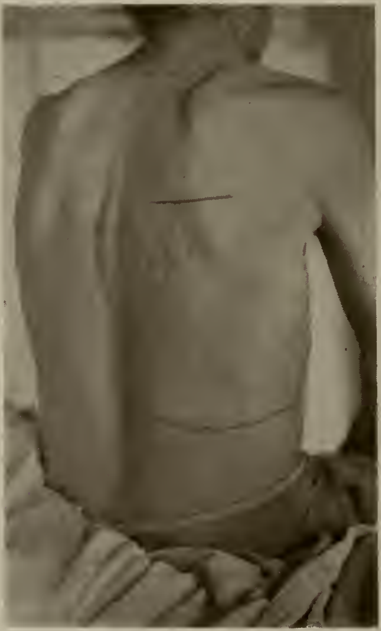

Fig. 141.—Outline of area of liver dulness on percussion. This reaches as high as the fifth rib, posteriorly. Photograph taken the day before the operation.

lower border of liver dulness reaches to the level of the umbilicus anteriorly, and the lower margin is plainly palpable where you can see the marks on the patient. The spleen is palpable 3 cm. below the costal arch, probably the result of the former malaria, for in liver abscess the spleen is not, as a rule, enlarged. No other tumors are palpable. Slight shifting dulness in the flanks suggests fluid. Genitalia and extremities show no abnormalities. All reflexes are normal. Rectal examination is negative.

The blood-pressure on admission was 115 systolic and 70 diastolic. A blood examination made September 13th showed hemoglobin, 60 per cent.; red blood count, 4,000,000; white blood count, 39,100; differential count: small mononuclear lymphocytes, 11 per cent.; large mononuclear lymphocytes, 4 per cent.; polymorphonuclear neutrophils, 77 per cent.; eosinophils, 2 per cent.; basophils, 2 per cent.; transitionals, 4 per cent. There was no abnormality of the red cells. Urinalysis shows color normal, specific gravity 1007, reaction acid, a trace of albumin, no sugar, and microscopically a considerable number of leukocytes, and many hyaline and granular casts.

The temperature chart shows an up-and-down curve, varying from normal or slightly subnormal in the morning, to a little over 99° F. in the evening; once only reaching 101° F. and only a few times reaching 100° F. His pulse ranges from normal to a little over 100, but usually is between 80 and 96. Respiration has not been increased, the usual reading being 20 to 24. Urination and bowel movements have been normal.

Here is an *x*-ray plate (Fig. 142) taken while he was on the medical service. The clinical diagnosis sent down to the roentgenographer was "suspected hepatic abscess," You can see the stomach was filled with an opaque meal. The findings recorded by Dr. Blaine read as follows: "The right diaphragm is seen to be unusually high and no activity of the same was seen on deep breathing. The lung is clear above the diaphragm. The stomach was seen to be displaced to the left. The findings would corroborate a diagnosis of subphrenic abscess."

Since the patient has been in the hospital he has been growing gradually weaker. As the medical service felt sure that pus was present they very properly did not make a diagnostic puncture. I wish to take this opportunity to emphasize the great danger to a patient of making a diagnostic puncture in these cases and then waiting till later before resorting to surgical

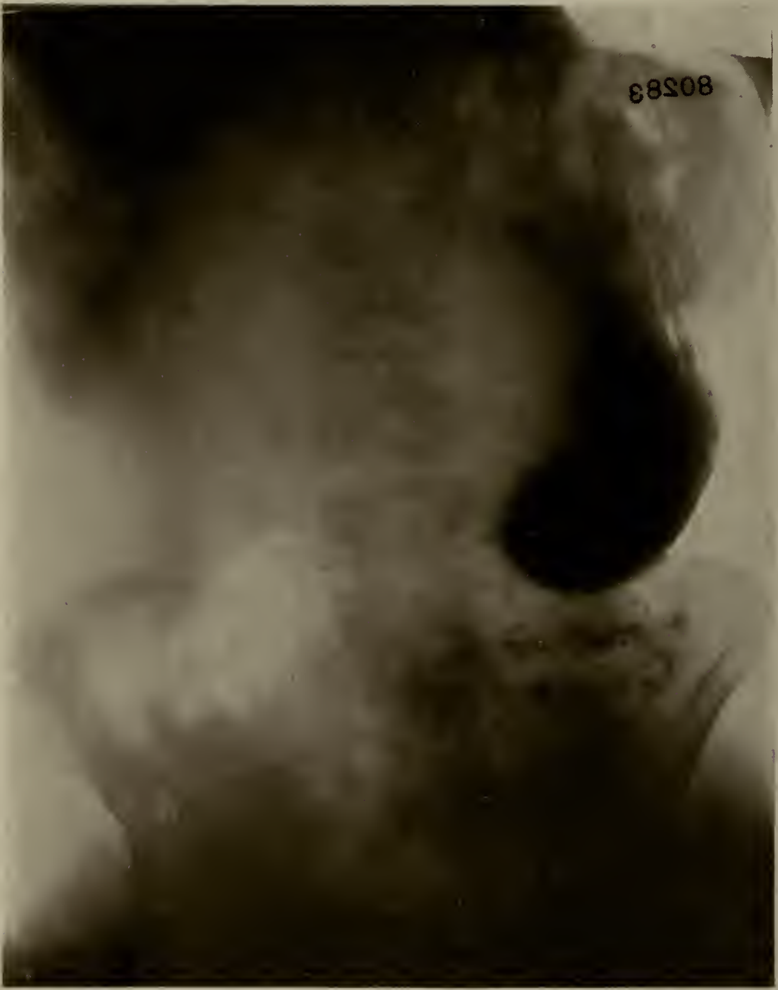

Fig. 142.—Roentgenogram taken with the stomach filled with a bismuth meal. Note how the stomach is displaced to the left. Fluoroscopic examination at this time showed the diaphragm displaced upward to the third rib on the right side, and immobile. No fluid in pleural cavity. Lungs negative.

intervention. Such a procedure is to be emphatically condemned *Never make a diagnostic puncture in any case of suspected liver abscess or subphrenic abscess unless you are prepared to proceed immediately to operate and drain.* As I shall begin by making a diagnostic puncture to locate the pus, I shall say more about diagnostic puncture in these cases in a few moments.

Yesterday I had the stools examined for amebæ, but, as I expected, none were found, for the patient has had no diarrhea since he was in Central America, and it is the rule to have a liver abscess develop long after the dysentery has disappeared.

Yesterday, also, I had an *x*-ray plate taken, giving particular attention to the right side of the diaphragm, the subphrenic space and liver below, and the right pleural cavity and right lung above (Fig. 143). You will note that the right side of the diaphragm reaches up to the third rib. Fluoroscopic examination showed it to be immobile. Above the diaphragm the pulmonary area is seen to be less clear than normal, but no area of consolidation is seen and there is no evidence of fluid in the pleural cavity. The left pulmonary area is clear. Below the diaphragm one can make out merely a large evenly black area. One cannot tell from the plate whether this is due to a greatly enlarged liver alone or to liver with fluid above it. Both liver and fluid have the same density as far as the *x*-ray is concerned, so that below the diaphragm one cannot differentiate fluid from the solid viscera. Above the diaphragm, however, one can differentiate sharply between fluid and lung tissue, for the latter has a markedly less density—*i. e.*, the fluid is in marked contrast to the air-containing lung. From this *x*-ray plate we cannot tell whether we are dealing with merely a greatly enlarged liver or with a subphrenic abscess which is pushing down an enlarged liver (there is no doubt but that the liver is enlarged). Frequently, in cases of subphrenic abscess, we find in our roentgenographic examination an area of decreased density immediately below the diaphragm and at its highest point, due to gas floating above the pus. This finding is particularly striking on fluoroscopic examination, for when the patient is turned on one side the gas changes its position, always remaining at the highest point.

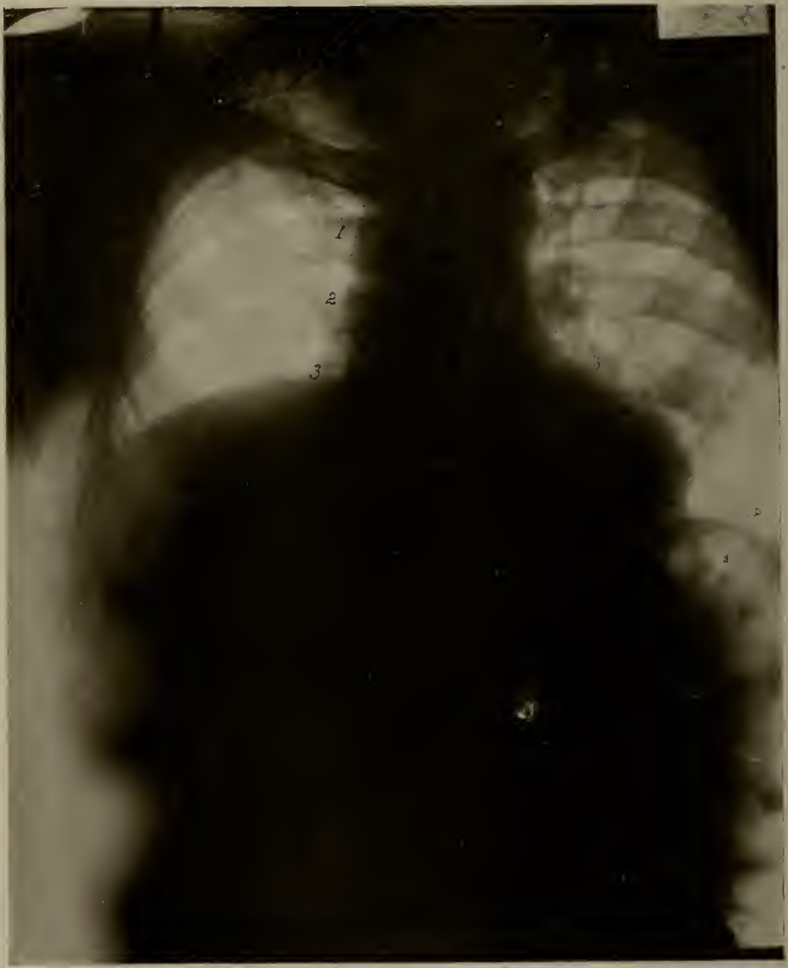

Fig. 143.—Roentgenogram taken the day before operation. The diaphragm is displaced high up on the right side, to the third rib. No fluid in the pleural cavity. Lungs normal. Liver greatly enlarged. Fluoroscopic examination showed the right side of the diaphragm immobile. 1, 2, 3, Anterior extremities of first, second, and third ribs respectively. *D*, Dome of left half of diaphragm at the level of the sixth rib. *S*, Air in stomach and colon.

This may be gas or air escaped from a perforated viscus (most commonly the stomach—from a perforated gastric ulcer), or to gas formed by gas-producing bacteria (most commonly Bacillus coli—in suppurative appendicitis cases). This plate shows absolutely no suggestion of gas below the diaphragm. When fluid with gas floating above it can be made out in the fluoroscopic examination a positive diagnosis of subphrenic abscess can, of course, be made. In other cases it is often difficult to make a positive diagnosis of subphrenic abscess.

In the case before us the history and findings are typical of liver abscess. We have all the characteristic findings as well as the history. The combination of enlarged liver, pain in the liver area, tenderness on pressure over the liver, fever, leukocytosis, a peculiar but not at all truly icteric color of the skin and sclera, gives us all the characteristic findings of the symptom-complex.

Without enumerating all the possible causes of liver abscesses, it may be of interest to mention the relation of liver abscess to dysentery, since this case followed an attack of dysentery. Amebic and bacillary dysentery show very different clinical and histologic pictures, and have a very different relation to liver abscess.

Bacillary dysentery is caused by four closely related species of bacteria: the bacilli of Shiga-Kruse, Flexner, Strong, and the Hiss-Russel Y-bacillus. That caused by the Shiga-Kruse bacilli is the most severe and shows a high mortality and frequent complications. In bacillary dysentery the changes are superficial and tend to remain localized in the mucosa, particularly about the ileocecal valve. Severe nervous and toxic symptoms, myelitis, and neuritis are common in bacillary dysentery, but do not occur in amebic dysentery. In bacillary dysentery liver abscesses are rare, and when they do occur are usually multiple small abscesses, and not a single large abscess, as is the rule in amebic dysentery. Buchanan did not find a single case of liver abscess in 1130 cases of bacillary dysentery. Thole believes that it is still questionable whether or not the bacteria causing the dysentery are the cause of the abscesses when they do occur, for the bacteria which cause bacillary dysentery have never been found in the pus or walls of the abscesses. The only bacteria found have been the B. coli and streptococci.

Amebic dysentery is caused by the Entamœba histolytica dysenteriæ of Schaudinn. It causes deep ulcers, particularly in the rectum and sigmoid flexure; the amebæ entering the submucosa by way of the glands cause necrotic ulcers that may reach even to the serosa. From these intestinal ulcers the amebæ enter the veins of the intestine and are thence carried by way of the portal vein to the liver. It is still not known with certainty whether the amebæ or the intestinal bacteria that are carried along with them are the cause of the abscesses in the liver. However, in fresh abscesses amebæ alone have been found. By the time cases come to operation the pus is very often, but by no means always, sterile. It is probable that as time passes the amebæ die off. Rogers found the pus sterile in 80 per cent. of the cases. Giordano in 72 cases found the pus sterile in 58.4 per cent, amebæ in 20.7 per cent., and bacteria in 9.6 per cent. Among the bacteria that have been found to occur are Staphylococcus, albus and aureus, B. coli, and pneumococci.

The commonest complication of amebic dysentery is abscess, and about 85 per cent. of all tropical liver abscesses result from amebic dysentery.

Tropical liver abscess is almost always a solitary abscess, though in some cases there may be several. It is usually located in the upper part of the right lobe near the convexity, particularly near the posterior axillary line beneath the ninth and tenth ribs. According to Thole they occur in the right lobe in 95 per cent. of the cases.

Clinically, abscess of the liver is rarely observed as early as one to three weeks after the onset of the dysentery. It usually develops much later, and may appear only after the lapse of years. A few cases have been reported in which it occurred even ten to twenty years after the dysentery. If the dysentery has been very mild, the liver abscess may apparently be the primary disease, and this may account for the so-called idiopathic liver abscesses. While the case we have here shows a classical example as far as the symptoms and signs are concerned, all cases are by no means so easy to diagnose. They may pursue an absolutely symptomless course. Rouis found the disease latent in 33 per cent. of the cases.

The peculiar facies we see in this man, the yellowish but not typically icteric pale color of the skin, which has been compared to dirty wax; the emaciation with deep sunken eyes, with their waxy subicteric sclera, is so typical that it has been described as a liver abscess facies.

The triad upon which the diagnosis is chiefly to be based, and may be considered as the symptom-complex, consists of *fever*, *enlarged liver*, and *liver pain*. Rouis found this symptom-complex incomplete in 79 per cent. of cases and complete in only 8 per cent.

There may be no **fever,** though it **seldom is absent entirely.** There is nothing in the type or course of the fever that is characteristic. As a rule, however, the fever is not high, and there is a tendency toward an evening rise, ordinarily not much over 100, just as in this case. Early in the disease the evening rise is often higher. A continuous higher temperature is rare. In chronic cases fever may be absent for long periods. In the more acute cases the fever may be intermittent and make one think of malaria, but, as mentioned before, in liver abscess there is, as a rule, no tendency for the spleen to be enlarged. At the time of onset the fever is not infrequently associated with chills, just as occurred in this case before he entered the hospital. If chills occur later in the disease it suggests that new abscesses are forming. The value of the fever as a diagnostic point, in association with an enlarged liver, is not of as great value as one might on first thought imagine, when one stops to recall that fever also occurs at times in other diseases of the liver in which that organ is enlarged, as, for example, syphilis, carcinoma, sarcoma, and hypertrophic cirrhosis.

Enlargement of the liver is always present in cases of solitary liver abscess. In cases with multiple small abscesses there need not necessarily be any enlargement of the liver. At the time of onset there is a diffuse hepatitis and the liver is enlarged in all directions; the lower border is felt to be rounded, and there is bulging of the lower intercostal spaces on the right side of the thorax. Later the enlargement may be upward or downward, depending upon the location of the abscess. Most commonly the abscess is located in the upper convex portion of the right lobe, and pushes the right half of the diaphragm upward, just as in this case (Figs. 142, 143), and the upper border of the liver is convex upward and generally reaches its highest point in the posterior axillary line (Fig. 140), and falls off obliquely toward the vertebral column. This part of the upper border of liver dulness is not typical in this case (Fig. 141). The entire liver is pushed downward, just as in this case. When, as occurs in about one-third of the cases, the abscess lies near the concavity of the liver, the epigastrium is bulged forward. When the abscess is very large pressure on the portal vein may cause ascites. Some suggestion of ascites is present in this patient.

The third important symptom, **spontaneous liver pain** and **pain caused by pressure,** is of great value in making the diagnosis. However, according to Rouis and Chvostek, it is absent in from 15 to 28 per cent. of the cases. The pains vary greatly in intensity; usually when the patient is quiet they are not severe, but may be so intense, as in this case, that they keep the patient awake at night. The pain is often local, and in a general way indicates the location of the abscess. When the abscess is located in the upper portion of the right lobe—the commonest location—the pain often radiates to the right shoulder-blade, as in cholelithiasis. As already mentioned, we have pain radiating to the shoulder in this patient, and it may be of interest to mention that the admitting room diagnosis in this case was "chronic cholelithiasis with hepatomegaly." According to Frock this radiation of the pain to the shoulder occurs in 13 per cent. of cases, while according to Kramm it occurs in 50 per cent. When the abscess lies well in the middle of the right lobe its location can often be determined by the pain caused by deep pressure in the intercostal spaces. If a perihepatic friction-rub chances to be present this will also aid in the localization. In this case no friction-rub is to be heard, but pressure over the lower ribs near the axillary line greatly increases the pain, though there is tenderness over the entire costal arch.

Among other important symptoms must be mentioned *interference with respiration.* This may be due to reflex immobility of the diaphragm or due to inflammatory paralysis. Furthermore, in a case where the diaphragm is displaced as far upward as in this patient, it may be due to mere mechanical compression of the lung. In the cases where a secondary pleural effusion is present, this still further interferes with respiration, but in this patient there is absolutely no pleural effusion. You will recall that one of the patient's complaints on admission was shortness of breath, yet, except for the great displacement upward of the diaphragm, the lungs are entirely clear (Fig. 143).

Marked leukocytosis is almost always present; according to Axisa, in 80 per cent. of the cases. The count is usually from 15,000 to 20,000. While a high leukocyte count is of great value in differential diagnosis, lower counts do not speak against a diagnosis of liver abscess. Thole points out that it is just in the cases where the differential diagnosis is difficult that the leukocyte count is of no help, for in cases with slight temperature and slight local findings the leukocyte count is not high, whereas in cases of malignant tumor of the liver, associated with fever, a high leukocyte count may be present. Williams, too, states that neither the relative nor absolute increase in polymorphonuclear leukocytes is of any aid in differentiating between inflammatory conditions and tumors of the liver. In this patient, as I stated before, there is a leukocyte count of 39,100. Such a hyperleukocytosis is, of course, of great value in substantiating a diagnosis of suspected liver abscess.

The physical findings as well as the results of the rontgenologic examination are such that a diagnosis of subphrenic abscess has been suggested, and it must be seriously considered. As I mentioned before, from the x-ray findings one cannot be at all sure in this case whether or not a subphrenic abscess is present. A primary subphrenic abscess probably does not exist. As a rule the infection is secondary to infection in the abdomen; only in a small proportion of cases is the primary focus located in the thorax. Infection passes much more readily from the subphrenic space into the pleural cavity than vice versa. We know that a not uncommon cause of subphrenic abscess is the rupture into the subphrenic space of a liver abscess, and that this usually occurs on the right side, because the abscess of the liver is usually in the upper part of the right lobe (Fig. 144). The only explanation for this occurrence that has been suggested, so far as we are aware, is that the right branch of the portal vein takes the more direct and vertical course. Whether or not this is the true explanation is very questionable.

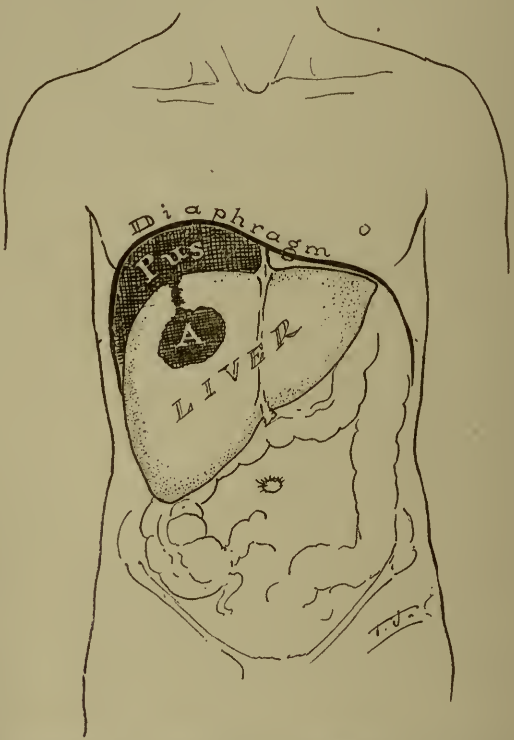

Fig. 144.—Diagram to show how an abscess in the right lobe of the liver near the upper convex surface ruptures into the right subdiaphragmatic space and causes a subphrenic abscess, as in the case demonstrated. Note that the pus is held to the right by the falciform ligament, and that we have a right intraperitoneal subphrenic abscess.

The subphrenic space is not one large continuous space, but may be regarded as being divided into six subsidiary spaces, depending upon the arrangement of the peritoneum in relation to the upper surface of the liver and the lower surface of the diaphragm, four peritoneal pockets, and two retroperitoneal spaces filled with loose connective tissue. The falciform ligament which attaches the upper surface of the liver to the arch of the diaphragm, extending as it does sagitally from the posterior margin of the liver forward to the anterior margin, divides the narrow space between the upper surface of the liver and the lower surface of the diaphragm into two halves, a right and a left space. Further, the right and left portions of the coronary ligament together with the corresponding right and left triangular ligaments divide the right and left space, respectively, into a large anterior and a small posterior part (Fig. 145). These constitute the four intraperitoneal spaces. The falciform and coronary ligaments each consist of two layers of peritoneum and stand at right angles to one another. Where these two ligaments cross a rectangular area exists between them, which is extraperitoneal and lies directly between the liver and the diaphragm, where these are in direct contact with no peritoneum intervening (Fig. 145, 5). This is the right extraperitoneal space. The other extraperitoneal space is in relation to the liver only at its left extremity, while the greater part is formed by the posterior perireneal tissue (Fig. 145, 6). This is the left extraperitoneal space. As first pointed out by Maydl, and recently emphasized by Eppinger, we thus have the possibility of having six types of subphrenic abscess, depending in which of these six portions of the subphrenic space the pus is located. It is only when we are dealing with a small, well-localized abscess that the pus is limited to any one of these spaces. When the collection becomes larger the abscess may spread and occupy more than one of these areas. In general, however, collections to the right or left of the falciform ligament tend to remain as either right or left subphrenic abscess. It is, therefore, particularly in dealing with small subphrenic abscesses that it is important to know the various possibilities as to location.

The **right intraperitoneal anterior abscess** (Fig. 145, 1) usually extends upward to the diaphragm, posteriorly to the right coronary ligament, medially to the falciform ligament, and laterally to the right wall of the thorax or diaphragm. The abscess is closed off from the general peritoneal cavity by means of adhesions. Where the infection has entered the subphrenic space from behind, these adhesions are usually located along the anterior surface of the liver. When the infection has come up from below and in front, the abscess usually extends to the omentum and transverse colon.

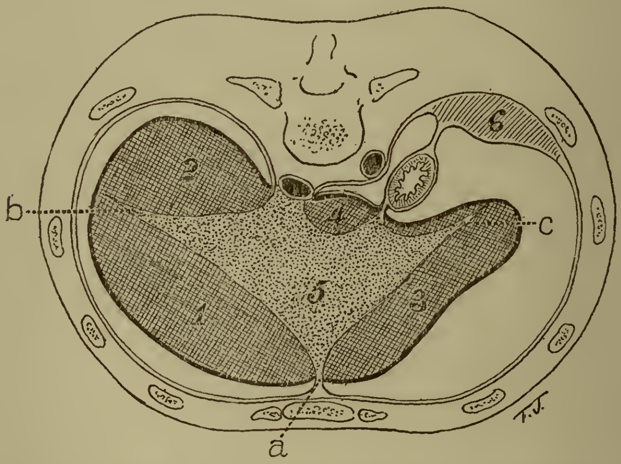

Fig. 145.—Diagram (after Braun) to show the various areas where small subphrenic abscesses may be located, and to which they may be limited. When the collection becomes larger the abscess may spread and occupy more than one of these areas. 1. Right intraperitoneal anterior subphrenic abscess. 2. Right intraperitoneal posterior subphrenic abscess. 3. Left intraperitoneal anterior subphrenic abscess. 4. Left intraperitoneal posterior subphrenic abscess. 5. Right extraperitoneal subphrenic abscess. 6. Left extraperitoneal subphrenic abscess. *a*, Falciform ligament. *b*, Right portion of the coronary ligament and the right triangular ligament. *c*, Left portion of the coronary ligament and the left triangular ligament.

The **right intraperitoneal posterior subphrenic abscess** (Fig. 145, 2) is in contact with only a relatively small portion of the diaphragm, the greater portion of the pus being subhepatic, and when completely filled this collection has a more or less pyramidal form, bounded below by a base formed by the lateral wall of the abdomen at the level of the twelfth rib, the apex extending around in front of and somewhat to the left of the middle prominence caused by the vertebral column. Anteriorly it reaches to the anterior margin of the liver, while behind and below it reaches to the right kidney, but more especially to the crura of the diaphragm. To the left the collection is so situated that the pus may easily extend into the lesser peritoneal cavity.

The **left intraperitoneal anterior subphrenic abscess** (Fig. 145, 3) is bounded above by the left cupola of the diaphragm as far as the left portion of the coronary ligament, medialward by the falciform ligament, on the left by the lateral wall of the abdomen, and below, in part by the upper surface of the liver, and in part more anteriorly and below by the upper and anterior surface of the stomach.

The **left intraperitoneal posterior subphrenic abscess** (Fig. 145, 4) is bounded laterally by the upper surface of the spleen, by the diaphragm above, behind by the pancreas, left kidney and adrenal, and below by the transverse colon.

The **right extraperitoneal subphrenic abscess** occupies the area between the reflections of peritoneum that form the falciform and coronary ligaments (Fig. 145, 5). It usually remains localized. It may, however, extend between the layers of the falciform ligament and ligamentum teres to the abdominal wall toward the anterior mediastinum. Similarly, laterally between the layers of the left coronary ligament toward the esophagus, or likewise to the right.

The **left extraperitoneal subphrenic abscess** (Fig. 145, 6) is not well limited. It exists in the loose retroperitoneal cellular tissue behind the left kidney. These left perinephritic abscesses tend to extend downward rather than upward toward the diaphragm.

Without going into detail, we may note that subphrenic abscesses to the right of the falciform ligament are the result of infection from the appendix, right lobe of the liver and the gallbladder, or right kidney; whereas abscesses to the left of the falciform ligament are caused chiefly by infection from the stomach, duodenum, pancreas, spleen, left kidney, and the left lobe of the liver.

When a subphrenic abscess is the result of disease of the liver, as may be present in this case, the symptoms of the liver disease predominate, as icterus, enlarged liver, enlargement of the gall-bladder, hepatic colic, etc. In this patient we have icterus and enlargement of the liver. In these cases it is usually impossible to determine when the subphrenic abscess began, for in purulent diseases of the liver it is, as a rule, only after these have existed for a long time that rupture into the subphrenic space occurs. It is, indeed, almost the rule that the diagnosis of subphrenic abscess is not made until during the course of the operation or even at postmortem.

In this patient the pain in the chest, the extremely high displacement of the diaphragm, marked downward displacement of the liver, even though it is greatly enlarged, with displacement of the stomach to the left (Fig. 142), make it reasonable to suspect the presence of a possible subphrenic abscess, but it is impossible to be certain until operation.

This brings us back to the procedure of diagnostic puncture.

As almost all amebic abscesses occur in the right lobe of the liver, it is easy to understand that subphrenic abscesses secondary to tropical liver abscess usually lie to the right of the falciform ligament. The commonest type is in the right extraperitoneal subdiaphragmatic space (Fig. 145, 5), as this space is in direct continuation with the liver tissue. Right anterior intraperitoneal subphrenic abscesses are also very common. Primary posterior intraperitoneal subphrenic abscesses are rare, as are also all left-sided abscesses.

It is generally recognized today that both liver abscess and subphrenic abscess call for free drainage by surgical intervention, and both can be successfully attacked by similar operative procedures.

As regards diagnostic puncture as a means of substantiating the diagnosis and determining the site of a liver abscess, the following points may be stated. As I emphasized before, it should only be done when it can be immediately followed by operative drainage. Multiple punctures through the pleura, the diaphragm, and even the lung are said to be without danger. Puncture through the abdominal wall, on the contrary, has been condemned because of the danger of infection and hemorrhage. There can be no question that the diagnostic puncture can be most safely done in the upper posterolateral portion of the liver, for here the liver is in close and firm contact with the diaphragm and abdominal wall. Diagnostic puncture should not be done on the anterior surface or in the left lobe, due to the danger of infection, hemorrhage, and possible injury to the stomach, intestines, gall-bladder, portal vein, or vena cava. If the abscess is believed to be located in the left lobe or near the under surface of the right lobe, one should perform an exploratory laparotomy. On opening the abdomen it may still be impossible to determine the location of the abscess. But now with the free peritoneal cavity packed off and the liver under control of the eye, puncture can be safely performed. In case of abscess in the usual location, if the puncture be made in an area bounded anteriorly by the anterior axillary line, and posteriorly by the posterior axillary line, and bounded above by a line not over 2 inches above the costal margin, one can enter the abscess at the highest point possible without entering the pleura, except in a minority of cases. It is important that the subsequent operative opening should be high up, for the liver always contracts during the course of healing.

In case a subdiaphragmatic abscess is suspected complicating liver abscess, as in this case, the diagnostic puncture can best be made in the same area.

In cases of liver abscess where the findings are not so typical as in this one, the following conditions would have to be differentiated: empyema of the gall-bladder, cholangitis, paranephritic abscess, acute pancreatitis, malaria, sepsis of obscure etiology, typhoid fever, miliary tuberculosis, but chiefly empyema and subphrenic abscess. I have already considered the differential diagnosis of these conditions when we looked at the roentgenograms. There are, however, a few points in connection with diagnostic puncture to which I would like to refer. In case the needle has penetrated the diaphragm before reaching the pus, as in subphrenic abscess or liver abscess, the needle will be raised by the diaphragm at each inspiration, whereas if we are dealing with an empyema or lung abscess, this motion is lacking. The absence of this movement does not by any means indicate that we have not penetrated the diaphragm, because, as I have previously pointed out, the diaphragm is frequently immobile when there is a large collection of pus below it. Indeed, this immobility is often of great diagnostic value as indicating the presence of a subphrenic abscess. Furthermore, when dealing with a liver abscess or a subphrenic abscess, if the needle is connected with a manometer the pus will show an increase in pressure during each inspiration due to downward pressure of the diaphragm, whereas in empyema there is a decrease in pressure at each inspiration.

Prognosis.—As regards the prognosis of liver abscess if not operated upon, there is no question that small abscesses may heal spontaneously with absorption of the pus and cicatrization of the abscess wall, or by calcification of the contents. Spontaneous cure may also result from rupture of the abscess through the abdominal wall or into neighboring viscera. While spontaneous rupture may result in cure in some cases, in others it may be the cause of a fatal outcome. According to Thierfelder rupture occurred into the bronchi in 74 cases, into the stomach in 32 cases, into the pleural cavity in 26 cases, into the peritoneal cavity with fatal peritonitis in 23 cases, into the intestine in 13 cases, and into the pericardial cavity in 4 cases. But spontaneous healing is rare and should not be waited upon. The indication is to drain the abscess at once.

Similarly, the prognosis of a subphrenic abscess is, as a rule, unfavorable unless promptly opened and drained.

Treatment.—Having found pus to be present in the liver or in the subphrenic space, one may open and drain: 1, Perpleurally, *i. e.*, through the pleura; 2, parapleurally, *i. e.*, around the pleura; 3, by means of an abdominal laparotomy (particularly in abscess near the under surface or in the left lobe); 4, by a lumbar incision, in case the pus is best drained by this route, which is rarely. The perpleural and parapleural routes are probably the most used today. The operation can often be satisfactorily done under local anesthesia.

The most favorable cases for operation are large solitary abscesses of the upper part of the right lobe, such as we believe we are dealing with in this patient. These are probably best dealt with by the perpleural route, either in a one-stage or a two-stage operation. A one-stage operation is the rule. While the two-stage operation more certainly protects the pleura from infection, the general condition of the patient by the time he reaches the surgeon usually will not allow a delay of a few days. We shall make our diagnostic puncture, and if we strike the pus here, operate perpleurally in this case.

In case the abscess lies not in the upper portion of the right lobe, but lower down in the right side of the right lobe, the parapleural transdiaphragmatic incision is probably the operation of choice. An incision is made along the ninth and tenth ribs from the costal cartilages to the posterior axillary line, and 4 inches of these two ribs resected. One locates the loose cellular tissue between the pleura and diaphragm in the phrenicocostal sinus, below the complementary space, and loosens the pleura and pushes it upward. In this manner one can expose the entire upper surface of the right dome of the diaphragm, which is then incised.

Operation.—We shall now proceed to make a diagnostic puncture in the ninth intercostal space in the right midaxillary line. You see we use an ordinary glass aspirating syringe with a long needle of medium caliber. The needle must not be too fine. I can feel the resistance of the diaphragm as I penetrate it. You see we have come upon the pus at once. I shall remove the syringe, leave the needle in place, and allow the pus to escape while I next proceed to resect a portion of the tenth rib. We shall send the pus to the laboratory and have smears and cultures made. One assistant will hold the needle carefully in place, while we proceed to open into the abscess. You will note that during each inspiration the pus escapes faster through the needle. This shows we are below the diaphragm. I make an incision along the tenth rib, about 4 inches long, and cut right down on to the rib. Then, while the assistant holds the skin margins retracted upward and downward with a pair of small sharp retractors, I push the periosteum which has been incised the entire length of the incision, upward and downward, gaining a subperiosteal exposure of the rib. With this Doyen periosteal elevator I carefully strip off the periosteum from the entire periphery of the rib at this point, being very careful not to penetrate the pleural cavity. Then, using this Schumacher costatome, which, as you can see, combines in one instrument a periosteotome and a rib-cutting forceps, I strip the periosteum from the rib backward and forward the entire length of my incision. I cut the rib first anteriorly, and lifting the divided portion somewhat, I divide the rib posteriorly, and remove this 4-cm.-long portion of the rib. You see we have not opened the pleura, and there is also no bleeding, for we were careful to hug closely to the rib and avoid the intercostal vessels. I shall now stitch the parietal pleura to the diaphragmatic pleura, so as to close off an area of the pleural cavity, and through this area open the diaphragm and the abscess. You see I use a large fully curved noncutting needle and heavy chromic catgut and make my stitches overlap. My stitches pass through the intercostal muscles, parietal pleura, diaphragmatic pleura and into the diaphragm and return. Where the stitches pass over the periosteum they pass right through it. You see we now have a circular area well closed off from the general pleural cavity, and this circular or, rather, elliptic area is as large as it is possible to make in the wound I have exposed. This man is very large and has a long chest and his interspaces are wide. In many cases, indeed as a rule, it is necessary to resect two ribs to secure ample room, but that is not necessary in this patient (Fig. 146).

Now with a scalpel I cut through the periosteum and parietal pleura and expose the diaphragm. Now, cutting deeper, I cut through the diaphragmatic pleura and diaphragm, and you see we are in the abscess cavity. There is surely an abundance of pus. Certainly more than half a gallon has escaped. We purposely have prevented this from escaping rapidly. With my

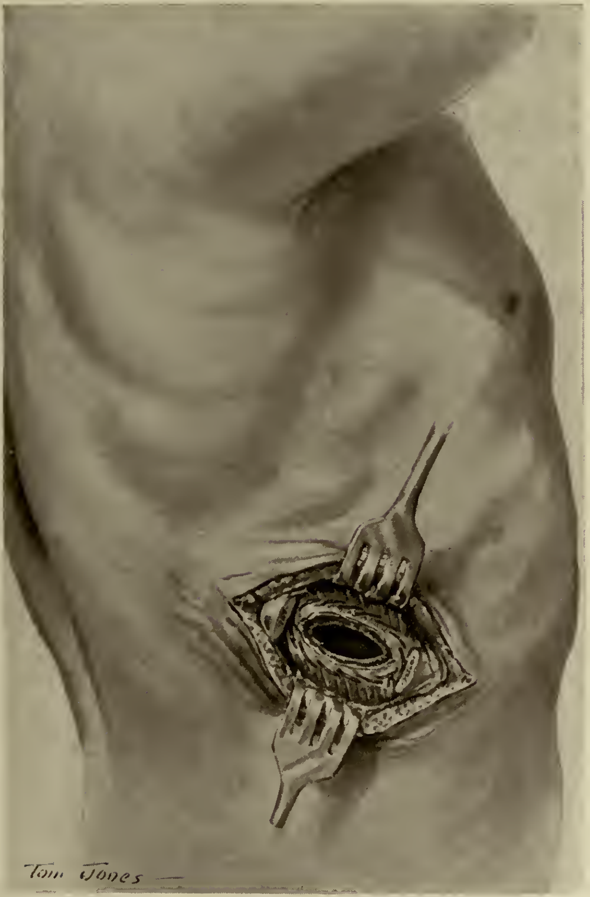

Fig. 146.—Technic of perpleural transdiaphragmatic drainage operation for the treatment of subphrenic and liver abscess—subperiosteal resection of the ninth rib in the right midaxillary line. Parietal pleura sewed to the diaphragmatic pleura and diaphragm by overlapping sutures that pass through the intercostal muscles (and periosteum where the stitches cross this), parietal pleura, then through the diaphragmatic pleura, and grasping a good bite of the diaphragm, return outward through these layers, thus closing off an elliptic area from the general pleural cavity. Incision through the periosteum, both layers of pleura, and the diaphragm, thus opening and exposing the subdiaphragmatic space and upper surface of the liver.

finger now introduced into the enormous space I can feel that the floor of the abscess cavity is roughened. It is apparently the upper surface of the liver which is covered with fibrin. We are dealing with an enormous, right intraperitoneal subphrenic abscess between the diaphragm and the upper surface of the liver. I shall irrigate the cavity with normal salt solution until the solution returns clear. I do not find the opening in the upper surface of the liver where the abscess ruptured into the subphrenic space. If I could find the opening I would enlarge it and introduce a drainage-tube. But after a liver abscess has ruptured, as has happened here, the abscess often rapidly shrinks, and I believe it would be folly to explore the liver further at this time, especially as the patient is in such poor condition. After drainage has been continued some time, if he still runs some temperature, it may be necessary to do a second operation to further explore the liver. He would be in better condition to undergo such an exploration later. I shall put in two large rubber drainage-tubes, stitch each of them in place with two silkworm-gut sutures, and allow them to remain till the drainage decreases. Later we may replace them with one smaller drainage-tube.

After-history.—The patient left the table in good condition, and made rapid progress, though he was very weak for a few days after the operation. There was an enormous amount of drainage for days. He was up and about the ward four days after the operation. I was taken ill myself the day following the operation and so could not follow the postoperative course. The record shows, however, that after he had been up and about he developed some fever. Nevertheless, he wanted to go home, and did so on October 15, 1919, contrary to the desire and advice of the attending surgeon. It is possible that the abscess in the liver was filling again and should have been operated upon. The subphrenic abscess drained freely the entire time the patient remained in the hospital.

I have written to the patient, but he has not replied, so I cannot state his condition at this time.

CLINIC OF DR. DANIEL N. EISENDRATH

Michael Reese Hospital

THE DIAGNOSIS OF TUBERCULOSIS OF THE KIDNEY AND THE TECHNIC OF NEPHRECTOMY

Summary: Suggestive symptoms—necessity of thorough urologic examination Facts to be learned by each of the special methods of examination. Technic of nephrectomy—position of the patient—choice of incision—exposure and mobilization of kidney—importance of aberrant vessels—management of ureteral stump—treatment of renal pedicle. Futility of palliative treatment of renal tuberculosis.

Scarcely any surgical disease of the urinary tract is so difficult to recognize as tuberculosis of the kidney. This is due to the fact that in the majority of cases there are few symptoms which would lead one to think of the kidney as the seat of the disease. Bladder disturbances, hematuria, fever of obscure origin, or the syndrome seen in the "silent" cases are very apt to lead one astray in the recognition of this affection. A thorough urologic examination combined with a careful analysis of the clinical history will enable one, however, to make a diagnosis in the majority of instances.

In looking over a large number of published cases and also those which I have operated upon, one is struck by the fact that cases presenting disturbances of the bladder constitute from 40 to 60 per cent. of the total number. The first symptom which the patients in this group remember is that they were obliged to rise at night one or more times, and then that this increased frequency was observed during the day. This diurnal increased frequency alone should direct our attention to the urinary tract. Gradually to the frequency is added pain just before or immediately after the act of micturition, tenesmus, and the passage of a little blood. Later on these symptoms, which so closely resemble those of ordinary (non-tuberculous) cystitis, become so aggravated that a physician is consulted. Unfortunately, too few of our profession are aware of the fact that the majority of cases of renal tuberculosis masquerade as cystitis, and the treatment so commonly given is that generally accepted as standard for a bladder infection. The urine will usually show a perceptible amount of pus at this stage, and if the physician stains the sediment and fails to find the ordinary pyogenic organisms, this alone should make him suspicious of a tuberculous infection and should suggest that a more thorough urologic study is needed. In other words, a patient complaining of symptoms of cystitis of long duration, whose urine does not contain pyogenic organisms and who fails to improve or gets worse after the application of the ordinary treatment, should receive a more complete examination.

In a recent paper Braasch found that in 203 cases of this disease observed at the Mayo Clinic the symptoms had existed for more than one year in 71 per cent., and less than a year in only 29 per cent. The sudden onset of bladder symptoms, therefore, is exceptional. As the disease progresses, bladder irritability is accompanied by the passage of urine containing considerable pus and also visible blood, either at intervals or constantly.

At times, especially in children and young adults, there is incontinence of urine either alone or accompanied by the symptoms of cystitis, of which I have just spoken.

The second most common group of cases is that in which pain of a dull aching character precedes the symptoms of cystitis. Wildbolz estimates that 43 per cent. of his cases fell into this class; Rovsing, about 60 per cent., and Crabtree, 35 per cent. The pain is of a dull aching character, but when clots of blood or caseous detritus are passed the pain becomes of a sharp colicky character, like that observed during the passage of a calculus. A third group of cases gives a history of one or more attacks of hematuria without any apparent cause. Braasch estimates that about 25 per cent. of his cases belong in this group, but this view is not shared by the majority of those who have analyzed an equally large series of cases. Of great interest are the other groups, viz., the fourth, in which there is a sudden onset of chills and fever with pain and rigidity over the kidney, resembling the syndrome of a typical pyogenic infection. These are usually cases of mixed infection, the diagnosis in many cases being made only at operation from the appearance of the sectioned kidney or when one finds both the tubercle bacillus and the pyogenic organisms in the pus. In the fifth group, the silent cases, there is more or less complete occlusion of the ureter. The urine is clear and there are few if any bladder symptoms. The gradual loss of weight and strength accompanied by slight fever and occasionally by dull aching over the kidney region, without any apparent local cause, should always lead one to examine the abdomen for the enlargement of one or both kidneys. In a sixth group of cases the appearance of a perinephritic abscess or fistula is the first symptom. This is a common mode of onset in children, and a bony focus must be excluded as the cause of such an abscess.

As was stated at the beginning of this clinic, the history, no matter how atypical it may be, should lead to a thorough urologic examination. Under this we include at the present time the following:

1. Examination of the testis, epididymis, prostate, and seminal vesicles, preceded by a thorough physical examination of the patient.
2. Cystoscopic examination.
3. Ureteral catheterization by means of which urine is obtained from both kidneys for bacteriologic, ordinary chemical, and microscopic study.
4. Chemical analysis of the blood, especially for the percentage of non-protein nitrogen and creatinin.
5. Estimation of the functional capacity of each kidney, preferably by the use of phthalein.
6. Pyelography, using thorium or sodium bromid solution.
7. *x*-Ray (ordinary).

Time will not permit me to take these up in detail, and no doubt the methods are familiar to you. I will, however, briefly summarize the principal findings by these methods in cases of renal tuberculosis.

Cystoscopy.—In a few early cases this reveals no changes in either the bladder mucosa or in the appearance of the ureteral orifices, and one must regard the bladder irritability in such patients as of reflex origin. In other early cases one notes only edema and redness of the ureteral orifice of the affected side. In some this edema may be of the bullous type. These early changes often present nothing pathognomonic of tuberculosis, and it is only after the urine is obtained by ureteral catheterization and the tubercle bacilli are found in the centrifuged sediment that the diagnosis may be made. As the disease in the kidney progresses, however, the bladder changes become so characteristic that the recognition of their tuberculous nature presents but little difficulty to the experienced observer. The presence of ulcerations and occasionally of tubercles on the edges of the ureteral orifice of the suspected side and the corresponding half of the bladder is quite typical. It is well to remember to examine the vertex and anterior wall of the bladder because the most typical ulcers are often found here. Later on the ureteral orifice becomes rigid, gapes, and is retracted, resembling a golf hole in its appearance (Fig. 147). The bladder wall becomes very rigid, and such a high degree of intolerance to fluids develops on account of the many ulcerations and lack of elasticity that a general anesthetic often must be given in order that cystoscopic examination may be carried out, the bladder scarcely being able to hold the 3 ounces regarded as a minimum for cystoscopy. To find the ureteral orifices in these advanced cases requires the utmost patience and dexterity. Every ulcer should be examined for the opening of the ureter.

Ureteral Catheterization.—There is no danger of infecting the healthy kidney by passing a catheter into the ureter of the non-involved side in order to determine the condition of this kidney. From the diseased side one is able to obtain the tubercle bacilli in the sediment after the use of a high-power centrifuge in about 90 per cent. of the cases, so that this method has superseded the older one of examining the mixed urine and simply finding the organisms in the urine without being able to determine whether they came from a focus in the bladder, genitalia, or from one or both kidneys. There is some difference of opinion as to the value of the guinea-pig test. Some contend that it is indispensable, while the majority of urologists believe, as I do, that it requires too much time (three to four weeks). By the Morton method of increasing the susceptibility of the guinea-pig by exposure to *x*-rays this can be reduced perhaps to eight to ten days, but even this delay is unnecessary.

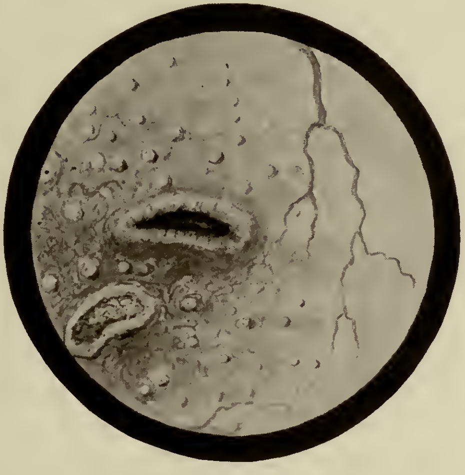

Fig. 147.—Typical appearance of bladder in a case of moderately advanced tuberculosis of the kidney. Note gaping character with raised edematous edges of the ureteral orifice giving it somewhat the appearance of a golf hole. In the vicinity of the ureteral opening are a number of miliary tubercles, and to the left and below is a typical tuberculous ulceration. (Heitz-Boyer, Atlas of Cystoscopy.)

Ureteral catheterization may be impossible on the diseased side owing to the presence of one or more strictures of the ureter, but on the non-involved side it gives us much information as to the ability of this kidney to do the work of both, if the diseased one should be removed.

I will take up the question of bilateral involvement later in connection with the case which will be operated on today.

Pyelography and Ordinary Radiography.—Braasch has recently made some valuable contributions to this portion of the subject. He found positive shadows due to calcium deposits in 22 per cent. of 131 cases of renal tuberculosis. There were two definite types of deposit: (*a*) Incrusted ends of calices; (*b*) caseated areas. The shadows fell under three groups: 1, Multiple small scattered; 2, single or a few localized 1 cm. in diameter; 3, large irregular diffuse areas involving a large portion of or the entire kidney. These last are the so-called "putty" kidneys.

The first changes, according to Braasch, seen in a pyelogram in a case of renal tuberculosis are a more marked irregularity in the outline of the calices, and a much greater variability in the outline of the calices, and a much greater variability in the degree of the dilatation of the individual calices, than is seen in the pyelogram of a non-tuberculous inflammatory dilatation of the renal pelvis. As the tuberculous process advances the calices begin to show a moth-eaten appearance, and still later one sees irregular, often separated, shadows scattered through the parenchyma. A ureterogram is also of the greatest value in these cases in revealing the presence of strictures and the degree of dilatation of the ureter. I am now in the habit of employing a 25 per cent. sodium bromid solution in my work in preference to thorium, and in the first case to be presented today we obtain a typical picture showing widely scattered shadows in the kidney region, indicating a tuberculous pyonephrosis.

CASE I.—The first patient whom I shall show you today was operated on eighteen months ago at the Cook County Hospital. For about a year preceding his admission he had suffered from increased frequency and painful irritation. The onset was quite gradual. He first noticed that he was obliged to get up several times at night to void urine, and then that this increased desire began to manifest itself during the day. Gradually the act became painful, the pain being most marked just before and after the close of urination. In fact, the pain toward the end of the act became so severe that it caused the patient to consult a physician. He had occasionally noticed that the urine, in addition to being turbid, seemed redder, but at no time was severe hematuria present.

The physician whom he consulted thought of a specific posterior urethritis, and treated him for a time with urethral injections. In spite of this treatment the symptoms became more aggravated, and he came to the hospital not complaining of any symptoms referable to the upper urinary tract, but to the bladder and urethra. Upon admission his urine was found to contain a considerable amount of pus, but no tubercle bacilli. Cystoscopic examination revealed the typical changes of moderately advanced tuberculous cystitis, most marked around the right ureteral orifice (compare Fig. 147). Catheterization of the left ureter and functional tests showed the presence of a left kidney which was capable of doing the work of both, should we decide to remove the right one. By catheterization of the right (diseased) side we found, in addition to pus, tubercle bacilli. Examination of the external genitalia at this time revealed negative conditions.

At operation we found moderately advanced tuberculous changes in the kidney (Fig. 148). The patient made an uneventful recovery so far as the kidney portion of the operation was concerned, but his bladder symptoms persisted for a long period. He was given one mesothorium treatment at the Michael Reese Hospital about six months after the nephrectomy, but did not receive much benefit. We have found this an extremely efficacious therapeutic measure in many of the cases of tuberculous cystitis subsequent to nephrectomy, and will publish our results later.

I did not see the patient again until one week ago. He states that in the interval of eighteen months since the nephrectomy he has gained 50 pounds in weight, but he returns to us today on account of an enlargement of the scrotum, a perineal fistula, and the continuation of some of the bladder symptoms from which he suffered before the operation. Examination reveals, in addition to a perineal fistula, quite marked typical advanced tuberculosis of both epididymi. Rectal examination reveals a nodule in the right lobe of the prostate, and considerable induration of the bases of both seminal vesicles. We are dealing in this case with a condition which may precede, accompany, or

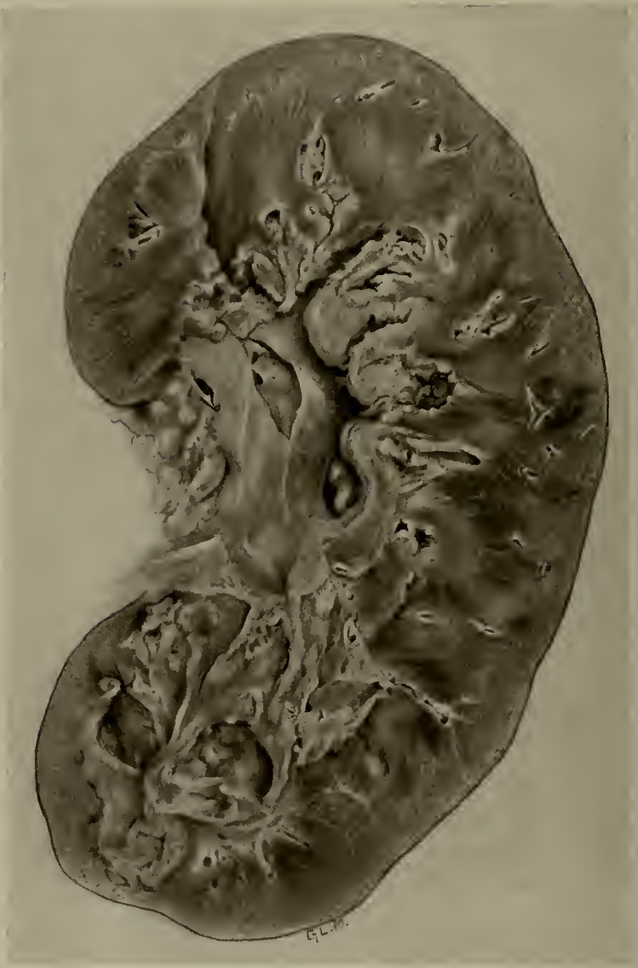

Fig. 148.—Section of tuberculous kidney removed in Case I, showing early stages of the disease. Note the eroded, ragged appearance of the papillæ and minor calices. This is most marked in the upper half of the kidney. The primary tuberculous focus is usually located in the niche where the mucous membrane of the pelvis is reflected upon the surface of a papilla.

follow tuberculosis of the upper urinary tract. There can no longer be any question that tuberculosis of the epididymis is the primary form of involvement of the genital tract in the male.

This may accompany or follow, as an independent focus, the tuberculous process in the kidney.

I will not discuss today the treatment of tuberculous epididymitis. I may say at this time, however, that my belief in the operative removal of such tuberculous foci remains unshaken after a considerable experience. The frequency with which tuberculosis of the epididymis accompanies or follows a similar disease of the kidney will be taken up in connection with the second case.

Case II.—This patient was referred for operation from a neighboring state, with the diagnosis of tuberculosis of the kidney. The patient is a boy of seventeen, who began about one year ago to notice increased frequency and painful urination, later accompanied by the passage of blood. He had lived on a farm and always enjoyed good health up to the onset of these symptoms. There was no history of tuberculosis in the family. On account of inability to secure relief from his local physician, he consulted a urologist, who made the diagnosis of tuberculosis of the right kidney from a cystoscopic examination and the finding of tubercle bacilli in the urine. On account of the debilitated condition of the patient nephrectomy was considered inadvisable, and the surgeon simply drained what he considered at the time to be a perinephritic abscess. This did not afford any relief to the bladder symptoms, so suprapubic cystotomy was done.

When I first saw the patient at the Michael Reese Hospital a few days ago I found him very much emaciated and anemic; thick purulent urine escaped from the suprapubic opening, and there was an abundant discharge of thin pus from a fistula over the right kidney. Adhering to my rule of making a thorough examination not only of the urinary but also of the genital tract, I found a nodulated swelling of the lower pole of the right epididymis, and a nodule about the size of a hazelnut in the right lobe of the prostate. The seminal vesicles, left lobe of the prostate, and left epididymis were normal. In view of the cystoscopic and operative findings of the urologist who sent the patient, there could not be any doubt as to the diagnosis of right-sided renal tuberculosis, but the next question was: Were both kidneys affected, and how could we ascertain this in the presence of a suprapubic fistula, which seemed at first thought to exclude a cystoscopic examination and ureteral catheterization? If we could only find one kidney involved, nephrectomy offered the best prospect of relieving this most distressing condition. Thanks to the use of a cystoscope which permitted continuous irrigation of the bladder while a sponge temporarily closed the suprapubic opening, I was able to secure a brief view of a normal left ureteral orifice and to insert a catheter into the ureter of this side, no attempt being made to catheterize the diseased side. The urine obtained was clear, contained no pus, blood, albumin, or tubercle bacilli, and phthalein injected intravenously appeared within five minutes. It was impossible to estimate the percentage of phthalein excreted within the first two hours from the left kidney owing to the fact that the cystoscopic examination could only be done after a general anesthetic had been administered, as the bladder changes due to long-standing tuberculous involvement prevented the introduction of a cystoscope under ordinary conditions. I can warmly recommend the use of a cystoscope which permits continuous irrigation of the bladder in cases where the discharge of either blood or pus from the kidney constantly obscures the field of vision.

Having decided that the left kidney was capable of doing the work of both if the right one were removed, I will now proceed to perform nephrectomy on the right side. The removal of the epididymis will be postponed until the suprapubic opening has healed, so that the operation can be performed in a clean field.

Operation.—In operations upon the kidney and lumbar portion of the ureter there are two positions in which the patient can be placed. Some operators prefer to use the prone position. Other operators (and I belong to this group) prefer to place the patient in a lateral position, with a pillow or a special kidney elevator which is attached to all modern instrument tables, under the iliocostal space of the sound side, so as to widen as much as possible the space between the last rib and the crest of the ilium upon the side to be operated upon. In order to prevent the patient from falling forward while in this lateral position I employ a special rest which I have devised for supporting the thigh and leg of the diseased or uppermost side, so that the patient is kept absolutely fixed in the lateral position.

The incision which I prefer (Fig. 149) extends from the costovertebral angle in an oblique manner downward and forward to a point about 1 inch above the anterior superior spine of the ilium. The abdominal muscles are divided at right angles to their fibers, care being taken not to injure the ilio-inguinal and iliohypogastric nerves, which are found in the muscular tissues above and below the line of incision. As soon as the lumbar

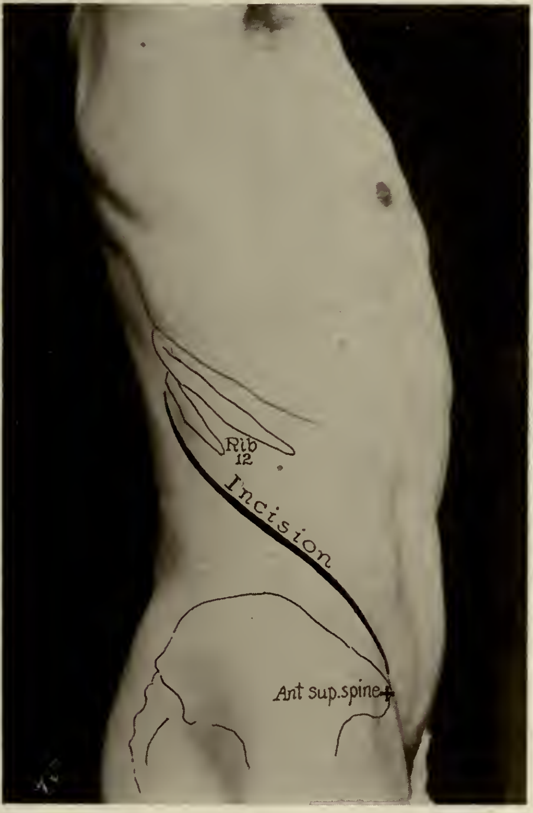

Fig. 149.—Location of incision in Case II. (See text.)

fascia is exposed it is incised and the perinephritic fat exposed. A few surgeons prefer a muscle-splitting incision, but although ideal in respect to lesser danger of hernia following the operation, the poor exposure obtained does not offset, in my opinion, this advantage. I would like to emphasize, in this connection, the necessity of being able to see every portion of the operative field in a kidney operation. Anomalous veins and arteries occur so frequently and adhesions are apt to be found so dense that a small field greatly prolongs the length of operation and increases its dangers.

In our patient we are confronted with a fistula following the former nephrectomy. These cases offer a far more difficult problem than where no previous operation has been performed. I prefer in such a case not to carry the incision through the fistulous opening itself, but to follow the same principle which is employed in operations for intestinal fistulæ, namely, to expose the tissues on either side of the fistulous tract, because one is less apt to find such dense adhesions. Having followed this plan, you will now see the exposed kidney, which is greatly enlarged and very firmly adherent to the abdominal wall in the vicinity of the fistula, as well as to the ascending colon, lying immediately in front of it (Fig. 150). Having found a line of cleavage between the kidney and the colon, we will now proceed to separate the two viscera by employing blunt-pointed curved scissors and spreading the blades. Adhesions of the kidney to the peritoneum and colon are among the most formidable difficulties which one encounters in nephrectomy. They are found especially in cases where long-continued infection exists with much involvement of the perinephritic capsule and immediately adjacent tissues.

Having succeeded in separating the colon from the kidney without opening the peritoneal cavity (Fig. 150, *B*), a fairly large gauze pad is placed upon the bowel and the latter held aside with a deep retractor. Great care needs to be exercised to protect the bowel and peritoneum from the edges of a retractor in the hands of an overzealous assistant.

The next step in the operation is to isolate the ureter. It is not difficult to identify the ureter in cases of tuberculosis of the kidney. As a rule, the ureter is much thicker than normal, and may reach the size of the adult index-finger. You can now

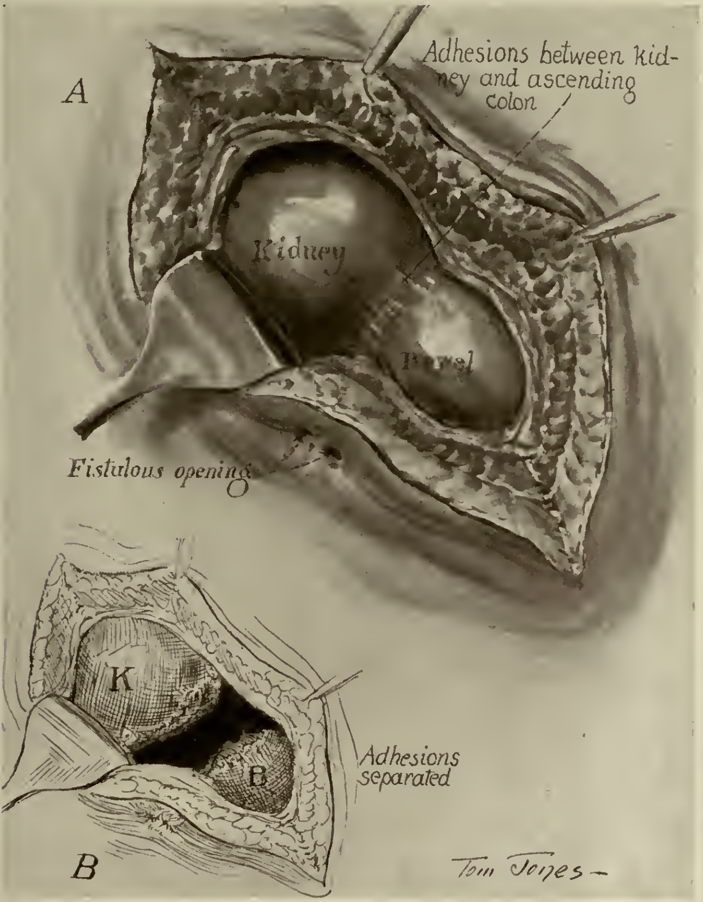

Fig. 150.—View of operative field. *A*, Appearance of wound in Case II before separation of adhesions between the kidney and ascending colon. Note fistulous openings along lower margin of wound. (See text.) *B*, Kidney separated from colon without opening peritoneum or injury to bowel.

see the ureter exposed at the lower angle of the incision. In order to keep it in position I suspend it upon a traction loop of catgut (Fig. 151). The question arises at this step of the operation as to the care of the ureter and how much of it should be removed. Some surgeons advise removal of all of the accessible portion through the original nephrectomy incision; others make a separate inguinal incision, pull out the ureter through this second incision after it has been divided close to the kidney, and then amputate as close to the bladder as possible. This total

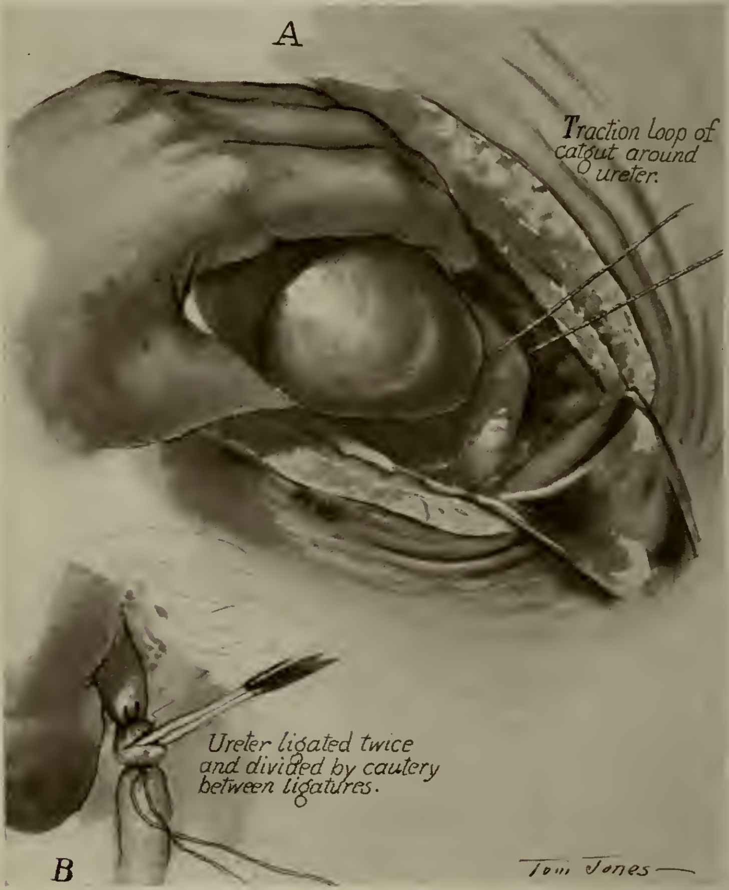
A
Traction loop of catgut around ureter.
Ureter ligated twice and divided by cautery between ligatures.
B
Tom Jones

Fig. 151.—*A*, Greatly thickened ureter isolated and brought into view by traction loop of catgut. The great advantage of division of the ureter before any attempt is made to mobilize the kidney is pointed out in the text. *B*, Ureter being divided between catgut ligatures with cautery.

ureterectomy has never been employed much. It increases the mortality and does not prevent postoperative fistulæ. I believe that the majority of operators today follow the plan which I shall demonstrate, namely, divide the ureter with the knife or, preferably, with the cautery (Fig. 151, *B*) after ligating the ureter close to the kidney. The distal end of the ureter will usually drain into the bladder, and the primary focus in the kidney having been removed, the ureter in the majority of cases will soon become transformed into a fibrous cord. It is very exceptional to be obliged at a later period to remove the distal portion of the ureter on account of the formation of a pus sac due to strictures which usually obliterate the lumen at the vesical end of the ureter. I believe that it is very important to divide the ureter as the first step in nephrectomy, especially in these difficult cases with many adhesions. I am indebted to Dr. Kolischer for calling my attention to this fact, *i. e.*, that the kidney can be much more easily mobilized after the ureter has been divided. It is necessary, of course, to ligate the proximal end of the ureter in order to prevent the escape of the contents of the renal pelvis into the wound. The treatment of the distal end of the ureter varies somewhat according to the experience of the individual operator. Some, like W. J. Mayo, prefer to inject 15 to 20 drops of pure carbolic acid into the lumen before ligation; others content themselves with simply cauterizing as much of the lumen as is accessible from the upper end. I believe that none of these methods present any advantages over the simple method of high cautery division between two chromic gut ligatures.

Having divided the ureter, we will now proceed to deliver the kidney into the wound. At this stage it is necessary to call your attention to the presence of accessory polar vessels which occur in 1 out of 5 normal individuals. These arise, in the case of lower polar vessels, either directly from the aorta or from the common iliac artery, or occasionally as a branch from the main renal artery to the kidney. You will observe how carefully I separate the tissues around the lower pole from the kidney itself. This does not require much additional time, and one is well rewarded in this search if a polar vessel is found. I have on several occasions observed almost fatal hemorrhages from overlooking such an accessory vessel. The lower pole having been found without polar vessels, we will now proceed to look for similar accessory arteries at the upper pole. These, as a rule, arise either directly from the aorta or as a branch from the main renal artery before it enters the kidney. An inexperienced operator will often mistake these vessels for adhesions, and divide or tear them, and apply forceps blindly in the effort to control the bleeding. The resultant hemorrhage may be thought to be due to a tear of the main renal vessels and forceps be placed on these without checking the hemorrhage. The upper pole in our case having also been found free of accessory vessels, our attention is next directed toward the structures of the renal pedicle itself. There is no difficulty, as a rule, in bringing these into plain view, but in some cases the pedicle is so short that it is safer to employ the two-clamp method of W. J. Mayo. In our case we are fortunate in being able to bring the kidney well into the incision, so that the vessels can be ligated *en masse* and also separately (Fig. 152). It is necessary in this connection to remember that we may have from two to five separate renal arteries or veins. I prefer in a case like this, where the kidney can be easily delivered, to apply one ligature of kangaroo tendon around the pedicle *en masse*, and then to transfix the pedicle distal to the *en masse* ligature with a second kangaroo tendon ligature. In order to prevent any accident I believe it is advisable to have an assistant steady the pedicle with a nephrectomy clamp loosely applied proximal to the ligatures before the pedicle is allowed to retract into the wound.

The kidney elevator will now be lowered, as some of the veins may not bleed when under tension. You will note that we have been able to ligate the pedicle without any hemorrhage. In certain difficult cases, where it is impossible to separate the true or fibrous capsule of the kidney from the fatty capsule owing to adhesions between these two structures, I have employed the method of Federoff, to which W. J. Mayo[1] has called attention.

---

[1] Surg., Gynec., and Obstet., 24, 1, Jan., 1917.

This addition to subscapular nephrectomy renders the ligation of the pedicle extremely easy. The kidney having been drawn out of its capsule, the latter is separated from the sinus of the kidney as it folds back over the pedicle. This allows the kidney

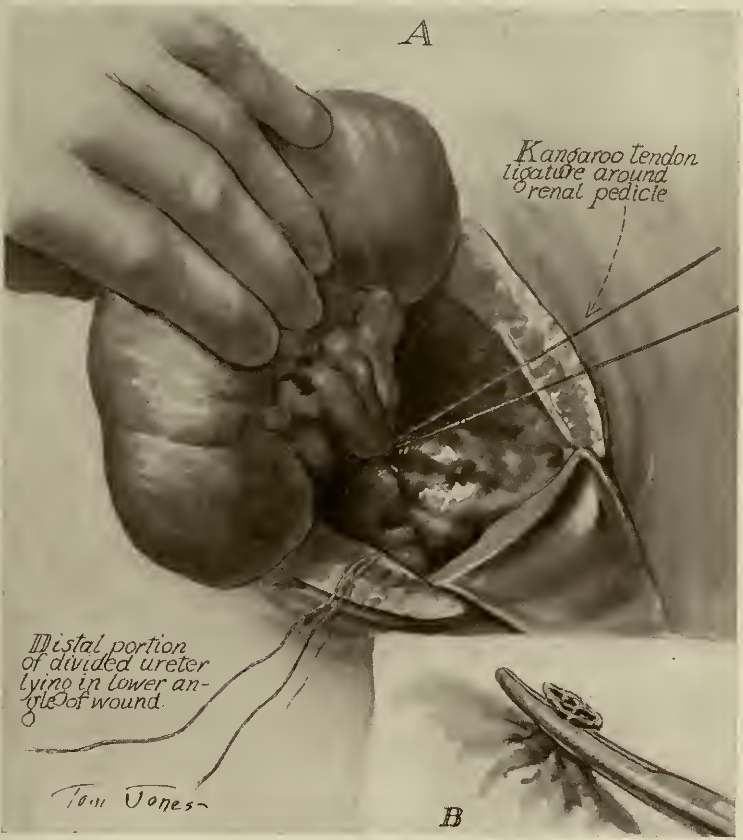
A
Kangaroo tendon ligature around renal pedicle
Distal portion of divided ureter lying in lower angle of wound
Tom Jones
B

Fig. 152.—Ligation *en masse* of renal pedicle with kangaroo tendon. (See text.)

with the renal vessels to be drawn through the capsule, top and bottom, by an incision through the capsule close to the pedicle. I believe it is important for every surgeon to be acquainted with this method, and I can warmly recommend the study of Mayo's article.

The removal of the kidney having been completed (Fig. 153), our next problem is how to take care of the ureteral stump, and whether or not to drain the wound. Some operators prefer, in case they have divided the ureter close to the kidney, to allow the stump to drop back into the wound. I usually employ the technic of Rovsing; that is, anchor the stump into the muscles

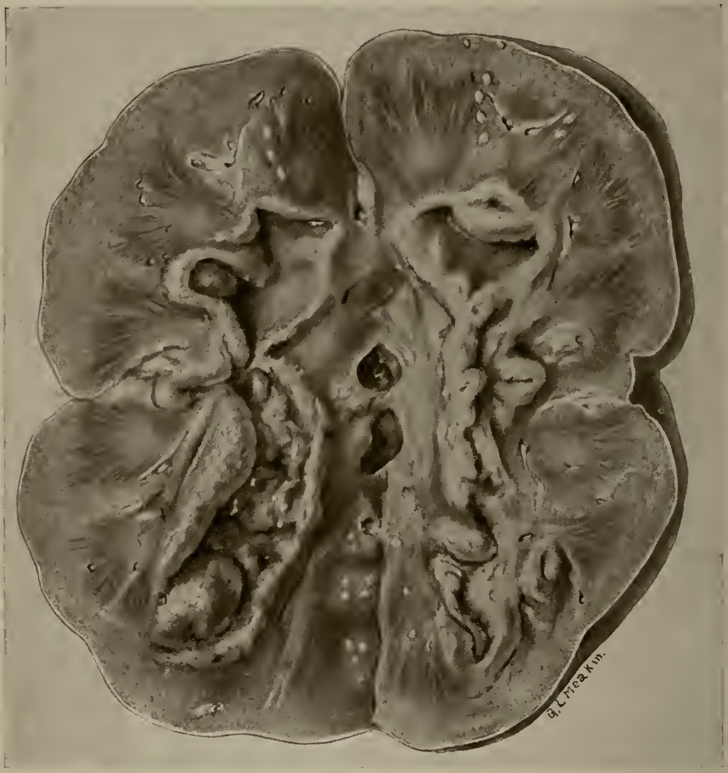

Fig. 153.—Section of tuberculous kidney removed in Case II, showing a little more advanced stage of tuberculous change than is shown in Fig. 148 (Case I). Note the typical undermined edges of the tuberculous ulcerations which involve the surfaces of the papillæ. In the upper half of the kidney the process is less advanced than in the lower half, where the ulceration has begun to invade the parenchyma. The presence of miliary tubercles in the upper and lower poles indicates a diffuse spread of the tubercle bacilli to all portions of the kidney by way of the intrarenal lymphatics and blood-vessels.

at the lower end of the incision (Fig. 154, *A*). The incision is closed in layers with catgut and silkworm. In order to prevent

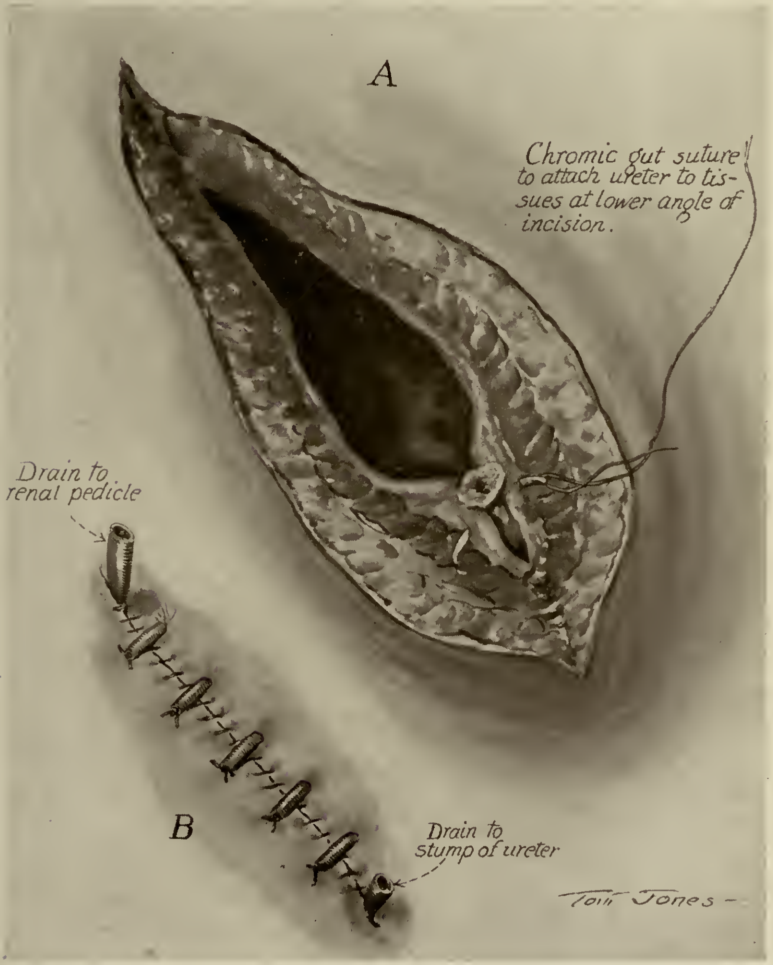
A
Chromic gut suture to attach ureter to tissues at lower angle of incision.
Drain to renal pedicle
B
Drain to stump of ureter
Tom Jones

Fig. 154.—*A*, Stump of distal portion of ureter sutured to muscles at lower end of incision. *B*, Appearance of incision before dressing is applied. Note tension sutures tied through rubber tubing to prevent their cutting.

the latter from cutting through I employ small sections of rubber tubing, through which the silkworm loop is passed before being tied (Fig. 154, *B*).

For a time it was customary to close the incision without drainage, but I believe that the percentage of cases in which a sinus or abscess formed after such closure without drainage was so large (75 per cent.) that this method has been abandoned in favor of the insertion of a cigarette drain at the upper angle of the incision.

Postoperative Notes and Comment.—Following the operation the urine continued to discharge through the suprapubic fistula for about two weeks. The urine, which contained considerable pus, gradually cleared up, and the suprapubic fistulous opening was closed at the end of about four weeks, at which time a right epididymectomy was performed and disclosed typical tuberculosis of this structure. The boy's general condition improved greatly. The kidney wound was allowed to close after the drains had been removed on the tenth day following operation. The patient was discharged from the hospital greatly improved at the end of eight weeks.

This case illustrates the difficulties encountered in attempting to make a diagnosis of which side is involved or whether both kidneys are affected. The advanced tuberculous changes in the bladder would have made a cystoscopic examination impossible without a general anesthetic, even if the suprapubic fistula had not existed. The value of employing a cystoscope permitting continuous irrigation of the bladder was very pronounced in this case. The presence of an apparently normal kidney on the left side showed that we were safe in removing the right kidney. The fistula which led to the latter had not opened into a perinephritic absecess as was suspected by the surgeon who operated, but into a tuberculous focus in the kidney itself. This shows the futility of expectant measures, such as the injection of bismuth paste, which have been advocated in these cases. The coincident presence of a tuberculous epididymis or its development after operation, as in our first case, is not at all a rare complication in tuberculosis of the upper urinary tract (Fig. 155). Wildbolz,[1] in his monograph on tuberculosis of the kidney, states that the most frequent localization of tuberculosis as an

---

[1] Neue Deutsche Chirurgie, vol. 6, 1913.

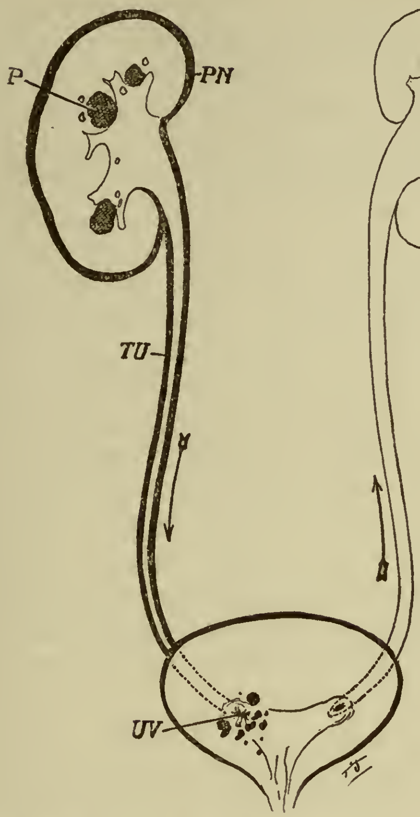

Fig. 155.—Diagrammatic representation of the course of the pathologic changes in tuberculosis of the kidney. The process begins, as a rule, as a papillitis (*P*), well shown in Figs. 147 and 153. The invasion of the parenchyma takes place through the lymphatics and through the blood-vessels of the kidney, and from here toward the perinephritic capsule (*PN*), which may be the seat of extensive tuberculous abscesses or of a thickening similar to that seen in the pleura in chronic empyema. The spread of the tuberculous process in a downward direction takes place along the mucous membrane of the renal pelvis and ureter, as indicated by the direction of the arrow. The ureter may either be greatly thickened or very much dilated. The bladder changes are most marked in the immediate vicinity of the ureteral orifice (*UV*) of the first involved side. The entire bladder soon becomes invaded and the tubercle bacilli, as a rule, find their way along the lymphatics of the other ureter to the kidney of the opposite side, in an ascending direction, as indicated by the arrow on the left side.

accompaniment or postoperative complication of tuberculosis of the kidney is in the prostate or in the epididymis; less frequently, in the seminal vesicles. Tuberculosis of the female genitalia is rarely associated with tuberculosis of the urinary organs. Raffin found, in 53 per cent. of his male patients, that there were tuberculous foci in the genitalia which could be diagnosed clinically in addition to the renal tuberculosis. Suter found such a complication in 57 per cent. and Wildbolz in 71 per cent. Crabtree[1] in 70 cases found that tuberculous epididymitis developed after nephrectomy in 5 cases, and tuberculosis of the prostate and seminal vesicles in 2. Altogether, 32.3 per cent. of all male patients developed tuberculosis of the epididymis either on the same or the opposite side, or bilaterally, before or after operation. I lay emphasis upon this complication because in both of the cases which I have just presented to you this complication was present, and I have observed it in about the same proportion in my male patients as is shown in the statistics of Crabtree. In the first case demonstrated today clinical tuberculous epididymitis evidently developed after the operation, but in our second case it probably occurred as a focus concomitant with the one in the kidney.

The end-results, as given in the statistics of Israel, Crabtree, Wildbolz, Braasch, and others, based upon a very large number of cases, certainly justify removal of the involved kidney in cases of tuberculosis. The percentage of cases in which complete recovery occurs is about 60 to 75 per cent. The early mortality—that is, those which die within the first six months—is 12.9 per cent. Of the late deaths—*i. e.*, after six months—about 45 per cent. are due to pulmonary tuberculosis, 35.9 per cent. to tuberculosis of the opposite kidney, and 14 per cent. to miliary tuberculosis. It is of great interest to note that tuberculous meningitis is a frequent cause of death in the late cases. The bladder symptoms are the slowest in disappearing, and it requires from six months to two years for these to subside. Among the most careful analyses of end-results are those of Braasch, Crabtree, Lower, Israel, and Wildbolz, and I would urge you to study these articles if you desire to have an endorsement of the necessity of early diagnosis and nephrectomy. The contraindications to operation are: advanced lung tuberculosis, multiple bone and joint lesions, prostatic abscess with perineal fistula, peritonitis, advanced bilateral involvement of the kidneys, and inability of the opposite kidney to perform the function of both.

---

[1] Surg., Gynec., and Obstet., vol. 21, 669, 1915.

Tuberculin and other forms of expectant treatment are only indicated when one of the above contraindications are present. In bilateral involvement the diagnosis can be made only (when cystoscopy and ureteral catheterization are impossible) by exposure of both ureters. If there is only slight involvement of the opposite kidney, this one has a much better chance to heal if the focus of infection in the more involved one has been removed. As a rule, however, nephrectomy is seldom of any benefit in bilateral disease. In 62 cases of this kind collected by Israel, 42 had died within a few months after the operation; in 3 surviving cases there was an interval of seven, eight, and sixteen years respectively after the operation. But there is no proof, according to Israel, as to whether in these cases the opposite kidney was really involved or not. In a recent publication by Legueu, in 58 bilateral cases, 34 died in from six months to seven years, and 22 were living eight years after operation.

This entire question of tuberculosis of the kidney is one of the most important with which we have to deal at the present time in urologic surgery, and I cannot urge you too strongly to acquaint yourselves with every phase of the subject.

CLINIC OF DR. GATEWOOD

Presbyterian Hospital

STRANGULATED OVARIAN CYST

Summary: Differential diagnosis of strangulated ovarian cyst. Operative findings in present case. Origin of cysts in the ovarian region.

The patient I shall show you first this morning entered the hospital during the night. She is a single woman, forty-two years of age, and a nurse. About six months ago I saw her when she was just recovering from an attack somewhat similar to the one which brought her into the hospital last night. At that time she told me that she had been troubled for about fifteen years with recurrent attacks of pain in the right lower quadrant of the abdomen, coming at varying intervals of six months to two years. In the first attack, fifteen years ago, there was considerable rise in temperature and also marked nausea and vomiting. Most of the attacks since then have not been accompanied by vomiting, although in each attack there was considerable distention of the abdomen, which was relieved by the passage of gas or by a bowel movement. Most of the attacks have lasted only a day or two, although the first one lasted several days.

As there was no definite tenderness at the time I first saw her and I had nothing except her history to aid me in making a diagnosis, I thought the most probable lesion was an infected appendix, perhaps with some foreign body acting in a manner similar to that of a gall-stone impacting the cystic duct. I advised operation at her convenience, but, as is usual with such patients, this was postponed indefinitely.

She now has a temperature of 99.6° F. and a leukocytosis of 11,400. She has not been able to sleep during the night and complains of a good deal of pain. This attack began three days ago when she was seized rather suddenly with a dull, aching pain in the right lower quadrant of the abdomen. This was followed by two stools without catharsis and the patient felt somewhat relieved. The following day the pain became generalized over the abdomen and for the first time was cramp-like in character. Several enemas were taken and expelled with considerable gas, and the patient was invariably relieved for short periods of time. The pain, however, continued to return and was very severe throughout most of yesterday. Examination of the abdomen shows, as you can see, a very rigid belly, particularly over the right side. There is no great tenderness over the upper abdomen. I cannot palpate the sigmoid, as the patient is moderately obese, but there is no very marked tenderness over it. Most of the tenderness is low down on the right side. Vaginal examination cannot be made without an anesthetic, as the patient is a virgin. Rectal examination reveals considerable tenderness in the culdesac, but I am unable to definitely outline any mass. Physical examination is otherwise negative.

This is the second case I have seen within ten days complaining of pain in the right lower quadrant of the abdomen with tenderness relatively low down. I know of no condition more difficult to diagnose accurately than the one with which we are confronted. One naturally thinks of acute appendicitis, with the offending organ lying over the pelvic brim or within the pelvis. In the preceding case the patient was just recovering from an attack of acute tonsillitis, which might have served as a source of infection for either acute appendicitis or acute salpingitis of streptococcic type. This patient has had no sore throat and there is no reason to suspect a neisserian infection. The fact that the tenderness is confined definitely to the right side speaks against a gonorrheal salpingitis. Because there is a history of a number of attacks, it seems likely that she has some chronic lesion, and yet the patient maintains that the pain is more severe, more steady, and rather different than at any previous time. Whenever possible in medicine it is well to make one pathologic condition fit a symptom-complex, but there are several things about the present attack which do not fit a diagnosis of appendicitis. In the first place, when a patient has a sudden severe pain in the lower abdomen, one should be a little guarded in making a diagnosis of appendicitis. According to this history, there were some cramp-like pains, but they did not occur until the patient had been ill for nearly twenty-four hours. Appendicitis, as a rule, begins with cramps and *diffuse*, not localized, pain.

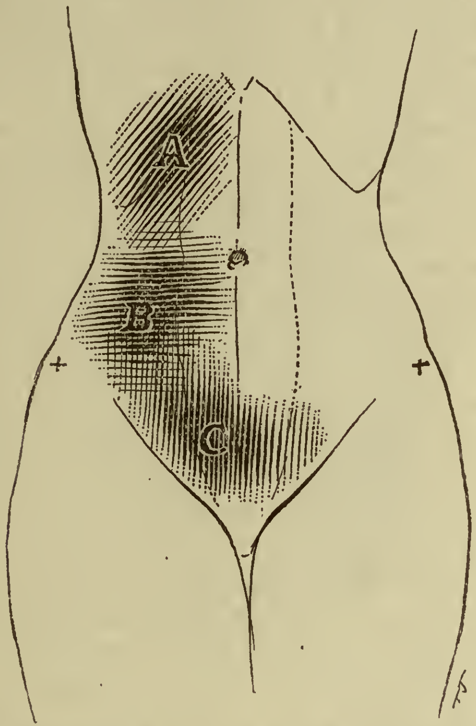

Fig. 156.—Diagram to show points of most marked tenderness in acute right-sided abdominal conditions: *A*, gall-bladder; *B*, appendix; *C*, strangulated ovarian cyst.

One rather valuable guide in diagnosing acute abdominal lesions is to ask the patient to take one finger and find the point of greatest tenderness (Fig. 156). I have frequently varied my incision according to the location of this point, and usually have found the pathology directly beneath the designated point. This patient places her finger on the point of most marked tenderness over the lower part of the right rectus (Fig. 156, *C*).

Taking all these facts into consideration and then considering in addition that the leukocyte count is relatively low for so much pain and tenderness, and that vomiting has been relatively in the background, I am inclined to believe that we may have to deal with a strangulated ovarian cyst in spite of the past history. I should probably give this diagnosis much less consideration had I not found an ovarian cyst which had been strangulated for almost three days in the case previously mentioned. In that instance I made the preoperative diagnosis of acute pelvic appendicitis, although rectally I could feel what I took to be an abscess, but which proved to be a cyst.

Owing to the uncertainty, I am making a midline incision, and as I open the peritoneal cavity I find a considerable amount of slightly turbid, straw-colored fluid. On bringing the appendix into view, I find that it is bound down by firm adhesions and that it is red and inflamed. Whether this appendix can account for the trouble or not is a question. One would not expect so much free fluid without more inflammation, but it is certain that there has been some appendical trouble from the character of the adhesions, and, therefore, I shall remove the appendix before exploring further. This is done in the usual manner, crushing the stump and then invaginating it with two rows of purse-string sutures, the first of linen and the second of catgut.

Examining the pelvis, I now find a soft globular mass about 2½ inches (6 cm.) in diameter. It is evidently a gangrenous cyst of some sort. As the contents of such cysts are frequently highly infectious, it is necessary before proceeding further to see that the rest of the abdomen is well walled off. I will have the head of the table lowered a little more before attempting to deliver the tumor. It is not adherent to any surrounding structures, so that removal is very readily accomplished. I am transfixing the broad ligament close to the uterus with a ligature carrier armed with moderately heavy catgut and will tie both sides and remove the cyst. It is very easy to cover the raw surface with a running catgut suture. It is important that I examine the opposite side before closing, as bilateral cysts are not at all uncommon, and even simultaneous strangulation of both sides has been reported. The left ovary is normal. As no pus has been encountered and there has been no leakage, I shall close the abdomen without drainage.

Had this patient complained of an acute, steady, severe pain with no preceding history, there would have been little difficulty in making a diagnosis of strangulated cyst. A pedunculated fibroid may give much the same picture, but I did not seriously consider it here because I felt that in a woman of her age I should have obtained some clue from her menstrual history and from rectal examination. Had I made a vaginal examination, or even a rectal, after the patient was asleep, I believe I should have been able to feel the tumor, although it is very soft. Incidentally I might have ruptured it, although this accident is much rarer than one might suppose.

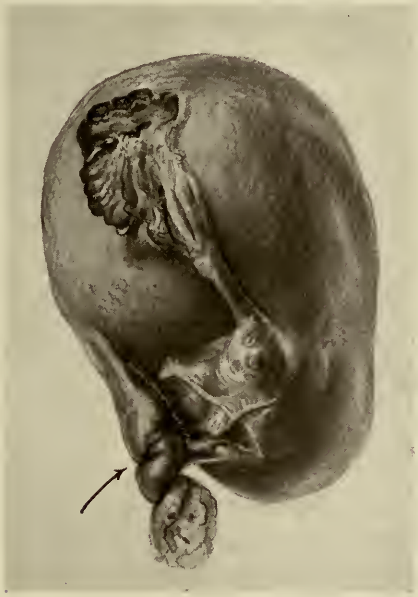

Fig. 157.—Specimen as it appeared immediately after removal. Note flattened, adherent ovary and tube, and twisted pedicle.

Let us now examine the specimen. It consists of a thin-walled bluish-black cyst, over the surface of which is spread a small, much flattened ovary. Attached to it is the right tube, which is gangrenous and swollen. The pedicle has been twisted two and one-half times on its axis (Fig. 157).

Theoretically, cysts in this region may arise: (1) from the follicles of the ovary; (2) from the corpus luteum; (3) from the germinal epithelium; (4) from remains of extra-ovarian tissues, as Wolffian or tubal "rests," or from remnants of paroöphoron, and (5) they may be mere retention cysts originating in the follicles or corpora lutea.

Practically, the origin of this cyst is very definite. Retention cysts are almost always small and multiple. Parovarian cysts and others occurring from rests are found in the broad ligament. They grow downward into the pelvis and, therefore, are much less likely to strangulate. This is a simple cystoma, originating within the ovary from the epithelium of a follicle or from the corpus luteum. On section there is no evidence of papillary proliferation and, therefore, none of malignancy, although careful microscopic examination will be made of the cyst wall.

I believe that this patient has had recurrent attacks of appendicitis, but I feel that the present condition has occurred entirely independently of the appendix pathology, even though the appendix is reddened and somewhat injected.

CLINIC OF DR. EDWARD LYMAN CORNELL

Chicago Lying-In Hospital

ECTOPIC PREGNANCY

Summary: Diagnosis and treatment of ectopic gestation.

I PRESENT for your consideration this morning a patient who was first seen last night at 5.30 P. M. She took a nap yesterday afternoon. At 4.30 P. M. she was awakened suddenly by a severe and sharp pain in the lower abdomen on the left side. She arose and went across the hall to her neighbor, who remarked how pale she looked. The neighbor called me. In the meantime the patient took an enema, which relieved the pain somewhat.

I will outline briefly the history of this patient as far as it is of interest in this case. She was delivered normally two years ago by me. She has had no previous illness of consequence. She denies venereal disease, as does also the husband. She is twenty-six years old.

Her last regular period was in July, 1919. She missed in August. In September she passed some clots, with considerable pain. I was not called at that time. In October she missed her period again. November 1st she began to flow some, and has continued to up to the present time.

When I first saw her yesterday she looked pale. Her pulse was not rapid. There was rigidity in the lower left abdomen and considerable tenderness. Vaginal examination, gently and carefully made, revealed a large tumor mass in the left fornix.

I urged her to go to the hospital for immediate operation, but she could not go until late at night. Preparations were made accordingly for 8 o'clock this morning. As a complete examination was not made at the home, I am going to examine her vaginally under anesthesia before opening the abdomen.

There is a tumor mass on the left side. It has grown in size since last evening. Do not be rough in these examinations, especially in the home, as the tumor may rupture. You will note I am using very light palpation, yet I have ruptured the sac. We will open the abdomen immediately. Notice that the patient has become pale. The anesthetist is a little anxious, as the pulse has increased suddenly. Had this accident happened in the home last night it would have been a very serious question. This patient can bleed very rapidly, especially if a large artery is ruptured. To go back to the mass felt in the abdomen: It was about the size of a large grape-fruit. It was located probably in the tube, as it seemed to be connected to the uterus by a narrowed isthmus. The ovary on the right side is larger than normal. It may have a corpus luteum cyst. The body of the uterus is soft and about the size of a two months' pregnancy. The cervix is patulous and soft. There is a bloody vaginal discharge, but no clots. This is a case of ruptured ectopic pregnancy.

We are now ready to open the abdomen (five minutes later). A median incision is made from the pubis to within 4 cm. of the umbilicus. The rectus muscle on the left side is retracted from the median line to the left. As we reach the peritoneum we note it has a dark bluish color. This indicates blood in the abdomen. On cutting through the peritoneum liquid blood exudes. The diagnosis is correct. The peritoneum is slit to the pubis, using care not to cut into the bladder. The left tube is brought up into the wound and an 8-inch clamp is fastened at an angle with the tube and the uterus in order to control the bleeding coming from this large artery near the point of rupture of the ectopic pregnancy.

On examining this tube, it is noticed that there were two types of rupture—one intracapsular and one extracapsular (Fig. 158). The intracapsular rupture occurred at the fimbriated end of the tube, probably some time ago. The vaginal examination made a few minutes ago caused the rupture you note in this thin capsule. This was an attempt by nature to produce a tubal abortion. The fimbriated end of the tube was closed, so the mass of blood just distended it. Near the middle of the tube we note another rupture, an extracapsular rupture, which undoubtedly began yesterday evening. There is a rather large artery here. If this artery had been bleeding all night as rapidly as it was before the clamp was applied, the patient would have been exsanguinated. The vaginal examination undoubtedly caused it to rupture. You can readily see how friable the tissues are. Just a touch of the gloved finger in the ruptured area causes the capsule to tear.

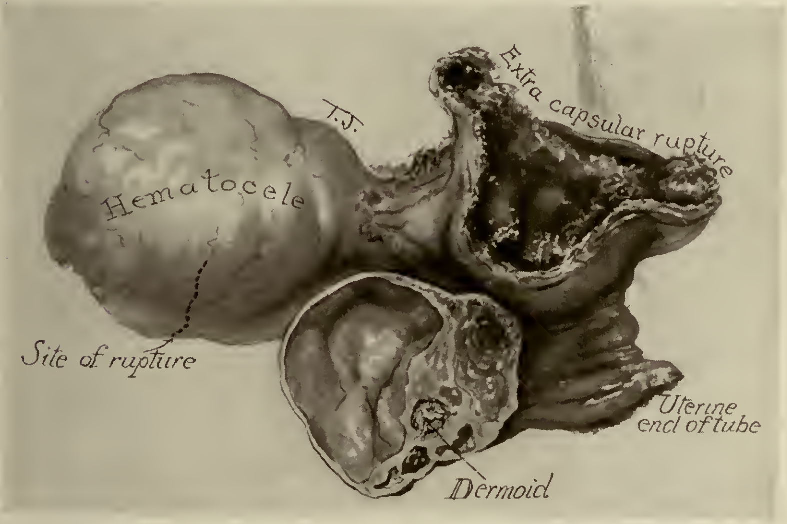

Fig. 158.—The outer end of tube distended by blood due to a previous intracapsular rupture. Dotted line shows where rupture took place on examination. Extracapsular rupture caused the abdominal hemorrhage. Note small dermoid in the ovary.

The ovary on this side contains two small cysts. It is also firmly bound to the tube in several places. There are many adhesions, freshly made, between the tube, ovary, and uterus. It is almost impossible to separate the tube from the ovary. If it were done in this case one could not be certain to control all the bleeding or to save the ovarian circulation. Hence it is best to remove the tube and ovary together.

With scissors we cut away the tube and ovary along the side of the clamp. Another clamp is placed at the end of the first one to control bleeding from the outer end of the tube. In order to control the tubal and ovarian arteries we pass No. 2, twenty-day chromic catgut around the clamps in a running suture. The clamps are removed slowly and the suture drawn taut and tied securely. The raw edges are sewed over to prevent adhesions.

This concludes the work on this portion. The right ovary is now brought up. It is large—about the size of a large lemon. It has a cystic appearance, yet it feels a little too firm for a simple cyst. On looking it over, we find very little apparently normal ovarian tissue. Here is a girl twenty-six years old. What shall we do? We ought to leave some ovarian tissue if possible, yet this ovary is not worth saving. It probably contains a dermoid cyst. We will remove it in spite of the fact that we dislike to cause premature menopause. We clamp the ovarian pedicle and cut it with scissors. The raw surface and ovarian artery are caught in a running suture similar to that used on the opposite side.

The appendix is inspected. It is larger in diameter than usual, somewhat injected, and has a few adhesions. We remove it in the usual manner by clamping the mesentery, passing a purse-string suture of linen, and cutting the appendix off after tying the lumen with catgut. The stump is treated with phenol and alcohol and buried. The mesenteric bleeding is controlled with catgut sutures.

The abdomen contains some blood which is not clotted. That which is easily accessible is removed, but no great effort is made to clean the abdominal cavity. We have seen no harm result from leaving blood.

The peritoneum, fascia, fat, and skin are closed in the usual manner adopted in this clinic; 1000 c.c. of normal salt solution are now injected under the breasts. The patient's pulse is 120, but good quality. She does not look quite as pale as she did. The normal salt solution will help to replace some of the lost blood volume. You notice it is readily absorbed.

Note.—This patient made a good recovery. She complained of abdominal pain for two days, after which she was quite comfortable. She was discharged from the hospital November 23, 1919. She returned for her final examination January 9, 1920. She was in good health, had gained 8 pounds in weight, and looked splendidly. The results of abdominal and vaginal examination were satisfactory. She has had no symptoms of the menopause.

We will examine the specimens grossly. The left tube has the two ruptures already noted. No trace of the fetus is seen.

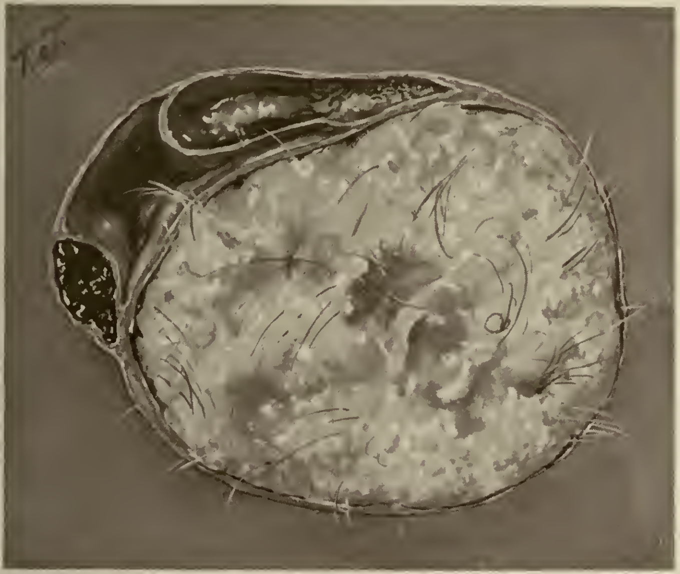

Fig. 159.—Dermoid cyst in opposite ovary from same patient as Fig. 158.

The tubal sac is quite thin. On holding it up to the light one sees through it readily. The left ovary, on splitting, shows two rather large cysts which contain a bloody mucous fluid. Near the bottom of the ovary we find a small cyst the size of a pea which contains a lemon-colored granular substance. On examining this material closely we find a small hair. This is a dermoid cyst just beginning. The right ovary is interesting. It too contains a dermoid (Fig. 159). Here we see material exactly like that seen in the small cyst in the left ovary. Many hairs are also seen. In the center is a mass of white tissue. This is an attempt at skin formation probably, as we see many hairs attached to it.

De Lee states that when any woman in the reproductive period runs over her usual time or has some irregularity in her menses, either a small amount or more profuse, has cramp-like pains in the lower abdomen, mostly unilateral, with irregular uterine hemorrhage, one should think of ectopic pregnancy. In this I agree.

The diagnosis of unruptured ectopic pregnancy is exceedingly difficult, especially in the early months. The tube, unless placed most favorably in the culdesac, is hardly distinguishable from the intestine. Many times adhesions form between it and other organs, such as the omentum, cecum, sigmoid, etc., which pull the tube out of the pelvis when the patient lies in the dorsal position.

Just such a case puzzled several of us a few months ago. Briefly, the history is as follows:

Mrs. I. S., age twenty-five, had her last regular period January 28, 1919. She presented herself for examination March 17, 1919. She missed the February period. On March 7th she began to flow for one day and then spotted every day. The breasts were painful. She had no particular pain in the adomen, but she had indigestion with eructation of gas. On the 18th and 19th she flowed considerably and passed some clots. The cervix was soft and patulous. She was put in the hospital and cureted. A diagnosis of mole was made. On April 22, 1919 she returned, with griping pains throughout the abdomen. She could not walk or sit comfortably. She was better when in bed. She was not constipated. She complained of indigestion and gas on the stomach. Vaginal examination was negative, except the uterus was slightly larger than normal. No masses were palpable in the abdomen. I sent her to an internist, thinking she had a gastric condition, as most of the tenderness was above the umbilicus. He placed her on a diet and mild elimination.

She did not improve. On April 30th she reported at the hospital, complaining of griping pains in the epigastrium. The pain had been more or less continuous in the upper abdomen. It was girdle-like in character and localized in the median line. It was present at all times and bore no relation to meals. She belched much gas and had a sour taste in the mouth. She had a poor appetite. The day before admission she had a severe attack of abdominal pain and grew pale.

For the first time (two hours before operation May 1st) a mass was felt in the left abdomen near the umbilicus. It was dull on percussion. The blood count in the morning was: reds, 2,020,000; whites, 9800; hemoglobin, 80 per cent. In the afternoon: reds, 1,880,000; whites, 12,800; hemoglobin, 60 to 70 per cent.

At operation the left tube was found adherent to the omentum at the level of the umbilicus. The tube had ruptured, but had not discharged the fetal contents. The abdomen contained about 1 quart of blood. The tube and ovary were removed.

Most text-books do not give enough attention to the diagnosis of ectopic pregnancy before rupture. I believe we would recognize more cases if we constantly bore the condition in mind. Most uterine hemorrhages, after missing a period, are considered as threatened abortions, and treated as such without examinations being made. This is a mistake. Each patient should be carefully and gently examined internally. The cervix should be inspected to determine whether the bleeding is extra- or intra-uterine. It is only in this way that abortion and that rather rare condition, angular pregnancy, are differentiated. I nearly operated a case of angular pregnancy for ectopic several years ago.

In angular pregnancy the history is that of a normal pregnancy until the third or fourth month. At that time there may be a gradual onset of pain, with uterine hemorrhage, which shortly (usually in forty-eight hours) ends in a true abortion. No anemia occurs. Upon vaginal examination the tubes and ovaries can almost always be palpated. The portion of the uterus involved in the pregnancy contracts, and one can then outline the entire uterus. The body of the uterus and the angular pregnancy can be moved both at the same time. If the pregnancy continues in spite of the slight uterine hemorrhages, the body gradually assumes the typical shape of the normally pregnant uterus.

The etiology of ectopic pregnancy is clouded. Several causes have been advanced. Among them may be mentioned salpingitis, peritonitis with adhesions, infantile tubes, accessory tubes, and diseases of ovaries. Salpingitis is mentioned first, as it is a frequent forerunner. It is usually due to gonorrhea, but may follow puerperal infection or appendicitis, either acute or chronic. The tube may be occluded in any portion, either internally or externally, from adhesions.

The ovum implants itself in the tube in the same manner as it does in the uterus. As it grows the tube thins out and endeavors to keep pace with the growing ovum. Decidua is formed more or less and soon the ovum closes the lumen of the tube. The villi bore into the blood-vessels. The latter increase in number and size. The tube is gradually distended to the point of rupture, the weak spot being located at the placental site.

The tube may rupture in any one of several ways, depending upon the location of the placenta and somewhat upon trauma. It may rupture (1) through the capsule of the tube into the peritoneal cavity, extracapsular; (2) the rupture may take place within the tube, the muscular layer separating, intracapsular; (3) it may protrude through the fimbriated end of the tube, tubal abortion; or, (4) it may rupture into the broad ligament, forming a hematoma.

In the former case, or extracapsular rupture, the tube does not empty itself usually, only a portion of the ovum protrudes, but the bleeding may be severe. The pelvis fills with blood, which clots. The peritoneum throws out fibrin. The omentum and intestines soon try to wall off the blood, forming what is known as a hematocele. This is the most dangerous form. In the intracapsular type the bleeding is confined, at least early, to the tube. The fimbriated end is occluded by clots and the tube becomes distended. More or less separation occurs at the placental site. This may be sufficient to cause death of the fetus, in which event absorption may eventually take place without further complication. Usually, however, the tube ruptures sooner or later, so that it resembles the extracapsular form.

Tubal abortion is the simplest form of ending ectopic pregnancy. Many of these cases are undiagnosed. Undoubtedly this happens many times without bad effect on the mother. Hemorrhage occurs at the placental site, loosening the fetus. It is protruded toward the fimbriated end. The tube behind becomes more or less distended. The bag of waters may rupture, expelling the fetus, either externally or into the blood-clots. Gradually the tube contents are forced out into the peritoneal cavity, where absorption takes place

When the rupture occurs in the broad ligament the fetus may or may not die. It may escape into the broad ligament and continue to develop, or into the peritoneal cavity. Usually the folds of the broad ligament are separated and a hematoma is formed.

Occasionally the fetus escapes and lives. It forms new attachments and continues to develop. This condition is known as secondary abdominal pregnancy. The omentum, intestines, uterus, bladder, and other organs are matted more or less firmly around the fetus. This presents a formidable problem at operation. Many cases of full-term deliveries are reported in the literature. The placental site and the sac present a big problem in their handling. The blood-vessels are so numerous and their walls so thin that hemostasis is difficult. Before the abdominal delivery the sac may rupture and the fetus be expelled into the abdominal cavity. The fetus dies. Absorption cannot take place. The fetus becomes calcified or mummified.

In ectopic pregnancy certain changes occur in the uterus. The cause of this is not known. It hypertrophies, decidua forms, it softens, and takes on the characteristics of a pregnant uterus. It rarely increases in size larger than a three months' pregnant uterus.

From what I have said you can appreciate the fact that we are dealing with a very serious condition offering great danger to life. Extreme care must be given to the diagnosis.

OVARIAN CYST SIMULATING ECTOPIC GESTATION

Summary: A patient complaining of abdominal pain, tenderness in the right lower quadrant, and the general symptoms of early pregnancy, associated with the discovery of a tender mass in the right adnexa; differential diagnosis; pathology disclosed by operation.

This afternoon we present a case in which the diagnosis is somewhat puzzling. It is either an ectopic pregnancy or a cystic ovary on the right side. This patient presented herself first on December 20th. She gave the following history:

Married November, 1918. At two months she had a criminal abortion performed, apparently with no bad after-result. In April, 1919 she had another criminal abortion performed at the second month. Her periods were always two weeks late. The last period was November 8, 1919. It was regular in character. On December 14th she spotted for a few hours. On December 16th she spotted again, and while in the bath-room fainted. She stated that after fainting there was some pain in the lower abdomen, more on the right side than the left. December 19th she spotted again and complained of pain on both sides of the lower abdomen. Her breasts were sore and somewhat enlarged. She was nauseated and vomited occasionally. On the morning of December 20th she vomited three or four times. She was tired all the time and had no appetite. Previous to this attack she had always been in good health, not having had a physician since infancy. With her other pregnancies she had no trouble with nausea or vomiting.

Her mother died of heart disease. Her father, 5 sisters, and 2 brothers are living and well.

The menstrual period began at fourteen years of age, six to seven days' duration, rather profuse, and without pain.

Upon examination that day one noticed that the patient was thin and the skin dry and pale. The heart and lungs were negative. The blood-pressure was 112 systolic and 72 diastolic.

The abdomen was distended. It was soft above the umbilicus and somewhat rigid below. There was more rigidity on the right side than on the left. McBurney's point was tender.

Upon vaginal examination it was noted that the neck of the cervix was softer than normal, in proper position, and closed. There were no erosions. On pushing the cervix up, the patient complained of pain on the right side. The body of the uterus was larger than normal and somewhat soft, there being a soft spot on the anterior wall. The left ovary and tube were normal. In the right fornix was found a mass somewhat globular in shape, about the size of a lemon. It was extremely tender and somewhat movable. Owing to the abdominal rigidity at the time of examination, it was difficult to ascertain just what the mass was. The gloved hand on removal was tinged with a brown secretion. The patient was advised to remain in bed and given alkalies and corpus luteum tablets to control the vomiting. The temperature was 98° F. and pulse 100.

On December 22d she came to the Chicago Lying-in Hospital because of repeated vomiting and pain in abdomen. After three days here the vomiting ceased, the nausea remaining. Her color improved and she felt considerably stronger.

This morning (12/27/19) a vaginal examination was made, and we found the mass on the right side had grown larger, quite tender, and seemed to be located at the outer third of the right tube. The blood count showed 4,500,000 reds and 8900 whites, with hemoglobin of 80 per cent. There was still tenderness over McBurney's point. The abdomen was not quite as rigid as it had been.

You will note from this history that the patient has missed one regular period and that she has spotted. She has vomited and has had pain in the lower abdomen. Her breasts are sore and she is nauseated. She has fainted.

I am going to examine this case vaginally under anesthesia, but, before proceeding with the examination, we should have some idea in mind as to what we will probably find. From these notes we would think of pregnancy, either normal or ectopic. Under ectopic pregnancy there should be mentioned tubal pregnancy, ovarian pregnancy, and pregnancy in the broad ligament. Normal pregnancy may be present, complicated by acute or chronic appendicitis, cystic ovary, fibroid, either simple or infected, salpingitis, and pelvic abscess.

This patient has been in the hospital for six days, during which time her temperature has been normal or slightly subnormal. Her pulse ranges from 60 to 80. The blood-pressure has remained low, ranging from 108 to 112 systolic and 65 to 75 diastolic.

Upon vaginal examination we find the perineum and vulva normal. The cervix is high and situated somewhat forward. It is softer than normal. The os is closed. There is no roughness. The body of the uterus is felt anteriorly and to the left of the median line. It contains a soft spot in the anterior portion. Also it is larger than normal. It is about the size of a two months' pregnancy. The left fornix is negative. The ureter is not tender. The ovary is felt and is normal in size. The right fornix presents something abnormal. There is a mass found which is about the size of a small orange. It is extremely tender when the patient is awake. It is soft and fluctuates. The impulse is transmitted from the abdominal hand. The right tube is felt running from the uterus, but it seems to end in the mass. In other words, the mass seems to be at the outer third of the tube. The ovary cannot be felt.

In this case infection can be ruled out, because the patient has had no temperature and the blood count is practically normal. It is evident that the pain is due to the mass in the pelvis which is not infected. That leaves the tumors. A cystic ovary is not necessarily very tender. An ectopic pregnancy in the tube or ovary is very tender. A cystic ovary gives fluctuation such as this mass does, but so will an ectopic pregnancy which is three months advanced, provided it is as favorably situated as this mass is. No ovary can be felt, but the tube can be palpated near the uterine end. The condition is either an unruptured ectopic tubal pregnancy or a cystic ovary.

The abdomen is opened in the median line, commencing about 3 cm. from the umbilicus. The incision is carried down about 8 cm. The recti muscles are separated. In this case the peritoneum is clear, showing there is no free blood in the abdominal cavity. The peritoneum is cut and the hand inserted. The uterus is found on the left side. It is about the size of a two months' pregnancy. It looks and feels as if it were pregnant. The left tube and ovary are normal in size and shape, as you can see.

The right tube and ovary are bound down by fine, easily broken, but extensive adhesions to the rectum and culdesac. I am breaking them up in order to deliver the cystic ovary through the abdominal incision. You will notice that the tube is adherent to the cyst at its outer third. The ostium, however, is not closed.

The tube and ovary on this side should be removed providing the tube is patent on the other side. A probe passed down the left tube shows it to be patent throughout. An 8-inch forceps is now passed behind the ovary and tube on the broad ligament. Both organs are then cut off (Fig. 160). A continuous No. 2 twenty-day chromic catgut suture is then passed over the entire length of the cut broad ligament and the 8-inch forceps is gradually removed as the suture is being drawn taut. Care must be taken that the ovarian artery is well secured. The raw places in the peritoneum are then closed, either with the same suture, as I am doing, or with interrupted sutures. This finishes this part of the operation.

The appendix is next inspected. It is found to be twisted on its mesentery. There are fine peritoneal adhesions around the appendix and mesentery. The appendix contains two small fecal concretions near the outer end. The organ is injected. We will remove it after ligating the mesentery, using the clamp, phenol, alcohol, and purse-string suture method.

The culdesac is again inspected for blood. We find that there is considerable oozing from the broken adhesions. Suturing will not control this, so we pack it temporarily with hot lap sponges. This controls the bleeding. The incision in the abdomen is then closed in layers. The peritoneum is closed with continuous No. 1 twenty-day chromic catgut. The muscle is brought to the median line and sutured there with a light running catgut suture. The fascia is then closed with No. 2 plain catgut. As this patient is thin, the fat needs no reinforcement. The skin is closed with a continuous subcuticular silkworm-gut suture. As we reach the center of the incision the silkworm-gut is brought to the surface and a second piece is tied loosely around it. It then re-enters the subcuticular tissues through the same opening and the suturing is continued. This leaves a fine hairline scar. When the suture is removed the small piece attached to the center of the buried silkworm-gut is lifted out of its bed and the main suture cut in two, then the suture is pulled out by the upper and lower strands.

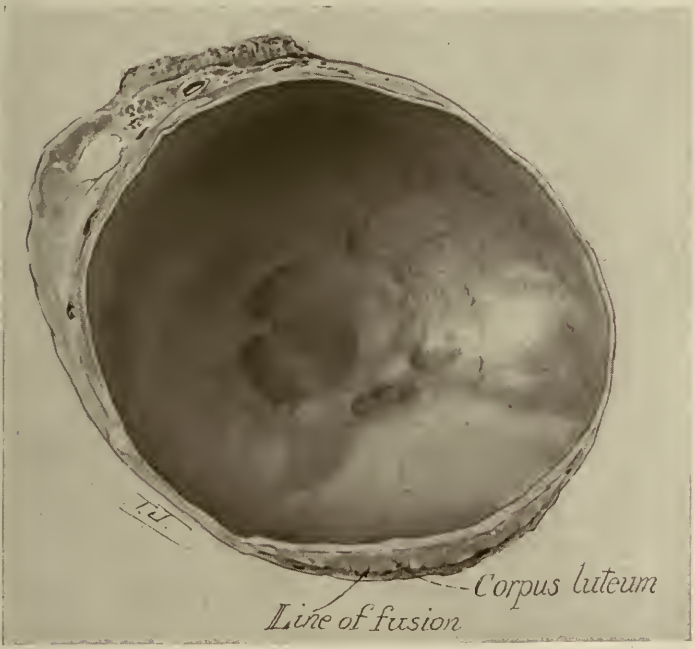

Fig. 160.—Cystic ovary removed from pregnant woman. Note the corpus luteum which has been pushed outward and its contents absorbed. The ovary left in place contained no outward signs of corpus luteum.

No stay sutures are used. I have not placed a stay suture in over two years. As yet no bad effect nor hernia has developed. In very fat women the fat is brought together either by interrupted or continuous No. 1 catgut placed near the skin.

Earlier I mentioned that tablets of corpus luteum were given to control vomiting. I have been using the 2-grain tablets for some time. In many cases they control the vomiting nicely. I start with one tablet after meals and at bedtime. The dose is gradually increased, if one does not control, until the patient is taking 16 a day. Usually 8 tablets a day are needed. This method of giving corpus luteum is not as effective, perhaps, as the hypodermic, but I find it difficult for a patient to make daily trips to the office to obtain the injections. I have been compelled, therefore, to try the oral method. I feel that the majority of cases are helped. In many it works like a charm. In others very little effect is noticed. In some the vomiting is made worse, even with the hypodermic method.

Occasionally we run across a case in which the vomiting seems to be reflex. The patient cannot keep food down. Corpus luteum, either orally or hypodermically, does not relieve. In such cases I have used successfully a pill containing cerium oxalate, bismuth subnitrate, and a small amount of cocain (Squibb). Care should be used in prescribing this pill because of the cocain in it.

REPORT ON EXAMINATION OF OVARIAN CYST

The wall of this cyst is composed grossly of two parts—one, the thicker portion, in which there is a flattened, yellow, disk-shaped mass (corpus luteum), and making up about one-fifth to one-fourth of the greatest circumference of the cyst; and, second, the remaining portion, much thinner, without any yellow tissue, and composing about three-fourths to four-fifths of the greatest circumference of the cyst.

Upon microscopic examination the cyst is found to be entirely without an epithelial lining. In that portion in which the wall is thin the cavity is lined by the stroma of the ovary; in the thicker portion of the lining is the flattened corpus luteum itself. This disk-shaped yellow mass contains in its outer portion a thin layer of typical lutein cells. In that portion adjacent to the cavity of the cyst the lutein cells have undergone degenerative changes, their nuclei are less distinct, and their cytoplasm is vacuolated. Between the cells in this portion there are vacuoles and spaces, many of which are larger than the cells themselves. The edge adjacent to the cavity is frayed, irregular, and ragged in appearance, as if some of the cells had slipped loose into the fluid-filled cavity, and as if the fluid had infiltrated between the cells producing the vacuoles and spaces mentioned above.

The outer surface of the corpus luteum is covered with ovarian stroma in which there are a number of small corpora albicantia. From this stroma there dip into the corpus luteum numerous trabeculæ of connective tissue. At various places in the substance of the yellow mass, especially in that half toward the cavity of the cyst, there are groups of fibroblasts and thin-walled capillaries among the more or less degenerated cells. There are also small hemorrhages into this new formed connective tissue, and a few phagocytic cells containing brown pigment granules are also present.

The thinner portion of the cyst wall contains no lutein cells. It is made up of ovarian stroma with an occasional corpus albicans, and a few small, compressed follicular cysts lined with flattened epithelium.

Summary.—This is a cyst without epithelial lining. A part of its wall is composed of a flattened, disk-shaped corpus luteum which is in direct contact with the fluid contents of the cyst.

Diagnosis.—Corpus luteum cyst of the ovary.

CLINIC OF DR. FREDERICK G. DYAS

Cook County Hospital

UMBILICAL HERNIA IN A BABY EIGHT HOURS OLD

Summary: Management of strangulated umbilical hernia in an infant; whisky-sugar anesthesia. Importance of search for coincident developmental anomalies in the presence of one discovered congenital defect.

The patient is a baby eight hours old, who was brought to the hospital immediately after birth. Examination at that time showed the cord intimately adherent to an oval mass which protruded from the umbilicus. This mass enlarged with inspiration and when the baby cried. It was impossible to return the contents to the abdominal cavity. The whole mass was about the size of an apple. Upon examination it seemed to consist of congested masses of the small bowel to which about 10 inches of the cord was adherent. A diagnosis of congenital strangulated umbilical hernia was made and immediate operation advised. In every other respect the baby was apparently normal; the mother gave a history of having had several other children, all of whom were normal.

Examination.—The hernial mass arises from an apparent congenital defect in the abdominal wall at the umbilicus and emerges alongside and apparently superior to the attached cord (Fig. 161). The covering of the mass at one point is detached skin, while most of the mass is covered only by a thin sac, through which the coils of intestine may be seen with distended blood-vessels on the serosa. On pressure over the sac the child cries. The cord is edematous and shows much excess of Wharton's jelly near the distal portion.

Operation.—The anesthesia consists of a few drops of whisky on a lump of sugar held in a square of gauze. The baby is allowed to suck this, and a small amount of whisky is added to the sugar from time to time. This produces a very safe and efficient anesthesia in infants and causes no unpleasant after-effects. The skin about the mass has been cleansed with soap and water.

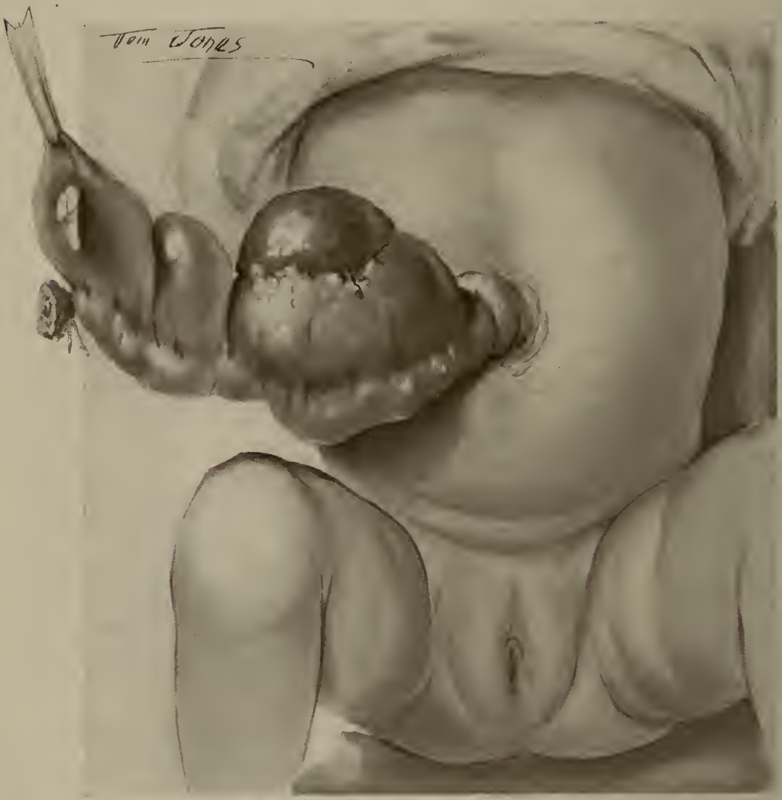

Fig. 161.—Hernial sac attached to umbilical cord for a distance of 10 inches. Multiple coils of intestine can be seen and felt through the thin sac wall.

We are making a transverse incision over the hernial sac, which we shall enlarge laterally to the limits of the hernial opening. The adhesions between the loops of the bowel and the peritoneum are separated and the small bleeding vessels ligated (Fig. 162, 1) The hernial mass is now reduced. The edges of the hernial opening are freshened and the fascia thoroughly

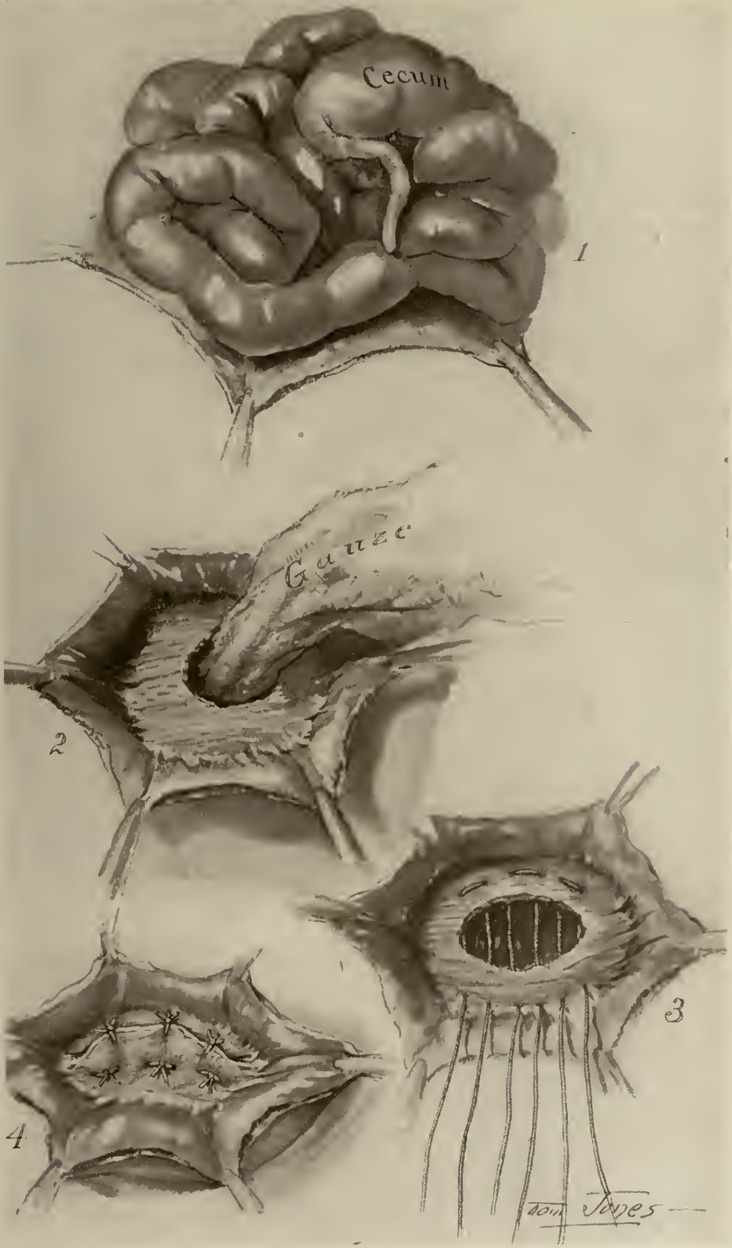

Fig. 162.—The sac was opened and the contents freed from adhesions (1). After reduction of the protruding bowel (2), the flaps of fascia above and below the hernial opening were imbricated by mattress sutures (3, 4).

dissected above and below in order to provide sufficient tissue to imbricate the edges (Fig. 162, 2). We are introducing three mattress sutures of chromicized catgut from below upward, leaving a good margin for overlapping (Fig. 162, 3). The upper flap is now sutured over the lower flap, producing a strong union, the line of suture running in a transverse direction, as the direction of the strain is transverse. In the closure of abdominal wounds the greatest strength may be obtained by making the repair in such a manner that the direction of the strain and the suture line may be the same. The skin is closed with silkworm-gut sutures and the wound covered with a collodion dressing.

Subsequent History.—The patient apparently did well for two days, when vomiting began and continued until the child died. In spite of prolonged vomiting and crying there was no evidence of giving way of the closure of the abdominal wall. Postmortem examination showed a congenital atresia of the bowel in the neighborhood of the descending colon.

This case emphasizes the importance of looking for further congenital defects in a patient in whom some acute condition brings the original defect to notice. Frequently in congenital hernia there may be other anomalies of development, as noted above. In the genito-urinary system hypospadias or cryptorchidism may indicate the presence of a horseshoe kidney or a unilateral kidney.

INTESTINAL OBSTRUCTION

Summary: A patient with symptoms of acute intestinal obstruction localized at the site of an abscess in an old laparotomy scar. Operative treatment —omission of peritoneal irrigation in the treatment of localized peritonitis. Postoperative history.

The second patient we have for operation today is a single woman, twenty-seven years of age, who was brought to the hospital complaining of pain in the abdomen. On admission a diagnosis of intestinal obstruction was made.

Twenty-four hours before admission the patient was seized with acute abdominal pain, nausea and vomiting, inability to move the bowels, and distention of the abdomen. The pain and distention have gradually grown worse until at the present time there is a mass on the right side of the abdomen in which peristaltic waves may be seen. The point at which these waves are arrested is at the site of an old laparotomy scar. There is redness and fluctuation at this point indicating the presence of pus in the tissues of the abdominal wall. There is great tenderness on palpation. The patient says that the previous operation was performed for intestinal perforation. The cause of the perforation, however, cannot be ascertained, although the patient states that it was necessary to introduce drainage-tubes and a purulent discharge continued for over a week. A diagnosis of intestinal obstruction due to old adhesions with an abscess of the abdominal wall is therefore made, and the patient immediately prepared for operation.

Under ether anesthesia I shall make an incision parallel to the old scar in order to avoid the adhesions. On opening the abdomen I find dense adhesions upon the under surface of the old scar, uniting the omentum and loops of ileum to the parietal peritoneum. On cutting through the abdominal wall a small amount of pus is encountered between the rectus and its posterior sheath. There are plaques of fibrinous exudate past-ing together the loops of bowel and there is a considerable amount of slightly purulent free fluid. In the lower portion of the ileum is a large diverticulum, at the very apex of which is a ragged opening from which intestinal contents are pouring out (Fig. 163). There is a considerable amount of formed feces in the peritoneal cavity opposite this opening. On either side of the diverticulun there are patches of gangrene in the bowel wall for a distance of about 6 inches on either side. It will, therefore, be necessary to remove about 18 inches of ileum in order to make the anastomosis in healthy tissue. We shall do this in the usual way, making an end-to-end anastomosis by the Connell suture method. We have sponged the fecal material from the abdominal cavity, but no attempt has been made at irrigation,

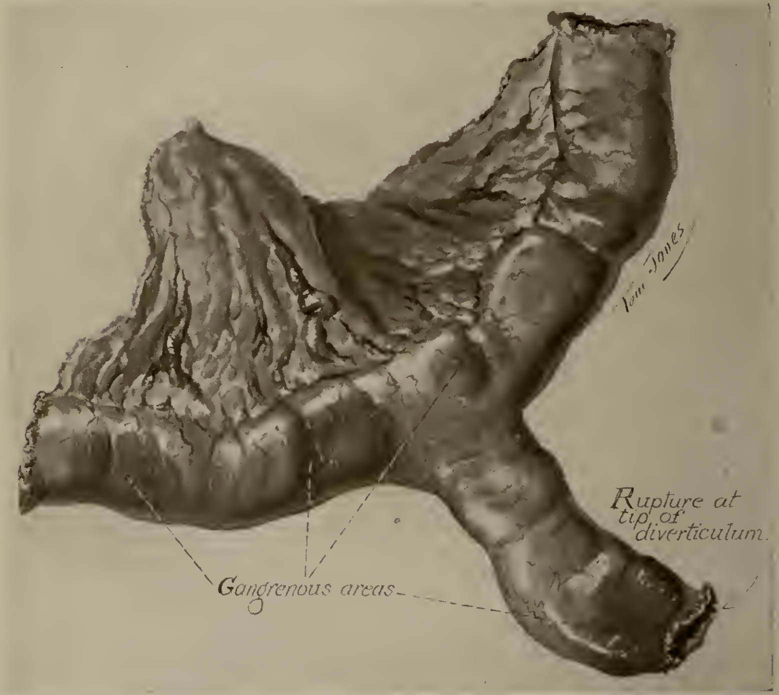

Fig. 163.—Specimen after removal. Note gangrenous areas in bowel wall and ruptured diverticulum.

as this would only serve to disseminate the infective material to the remotest areas of the peritoneum and to convert a more or less localized infection into a true generalized peritonitis. We are closing the incision down to the lower portion, where we have inserted two drainage-tubes, one leading down to the anastomosis and the other to the lower part of the pelvis.

Subsequent History.—The patient was put to bed in the Fowler position, given proctoclysis and, after twenty-four hours, a small amount of liquid by mouth. After forty-eight hours she passed flatus, and on the third day had a small movement with the aid of a low enema. She has made a complete recovery, except for the infection of the abdominal wall which was present at the time of operation. Her temperature has at no time gone above 100° F., and we believe this is due to the fact that the peritoneal cavity was not irrigated, thereby not spreading the infective material over the whole serous surface.

SURGICAL CLINICS OF CHICAGO

Volume 4 Number 3

CLINIC OF DR. ALLEN B. KANAVEL

Wesley Memorial Hospital

EMPYEMA

Summary: Demonstration of two patients and a discussion of the treatment of empyema, with especial reference to methods of draining, sterilizing, and obliterating empyema cavities.

A few weeks ago we discussed the etiology and pathology of empyema. Today I wish to present to you 2 patients, both suffering from the presence of pus in the pleural cavity, and to discuss in some detail the question of the treatment of empyema.

Case I.—This patient is a child of five years, whose trouble began in January, 1919, with a severe attack of influenza, lasting for about three months. Three weeks after the onset of the trouble her mother noticed the presence of a swelling of the left side of the chest, and that the patient always lay on the left side if undisturbed. In March she was allowed to get up, and remained up and about until December 1st, but with a constant cough, and more or less persistent fever. About November 1st her mother first noticed that her breath was very foul. One week later the patient coughed up 2 tablespoonsfuls of blood.

On December 1st she was admitted to this hospital with a temperature of 102° F., a leukocyte count of 21,000, and the physical signs of fluid in the left side of the chest.

Three weeks ago the pleural cavity was opened by a resection of 1 inch of the seventh rib. The cavity was drained and negative pressure established, but the negative pressure was not effectively maintained, so that now she has an extensive pneumothorax, the heart is definitely displaced to the right, and her general condition is rather worse than when the rib resection was carried out.

Case II.—This patient is a young man twenty-four years of age. His trouble began in December, 1915, with a cold and general malaise, lasting for about a week. On December 30th he became acutely ill with the symptoms of a severe pulmonary infection—pain in the chest, headache, vomiting, and high fever. On New Year's day he was taken to St. Luke's Hospital. After a week's stay in the hospital the chest was aspirated and some bloody fluid and pus removed. About five hours later he began to cough violently and complain of terrific pain in the right side of the chest. At 5 o'clock of the same day a rib resection was performed under nitrous oxid anesthesia, and a tube placed in the pleural cavity for drainage. No suction was applied at that time. Five weeks later the tube was removed and the wound allowed to close. He left the hospital one week after the removal of the tube with the wound healed. About six months after leaving the hospital the patient returned to work and remained fairly well for about a year.

In December, 1916, ten months after his discharge from the hospital, he noticed a splashing sound in his chest, apparently caused by a sudden movement of his body. This recurred at intervals for the next nine months, and was accompanied by loss of weight, an afternoon rise of temperature, and frequent coughing spells, with the expectoration of thick, brownish-red sputum.

In September, 1917 the chest was aspirated and considerable thick green pus removed. This procedure was repeated several times, and was followed each time by a temporary disappearance of the afternoon fever and a temporary gain in weight. In October, 1917, under chloroform anesthesia, two tubes were placed in the pleural cavity for drainage. One tube was removed after several weeks, and the second, a flanged silver tube, was left in place until the patient entered this hospital in June, 1919—a period of twenty-one months. Throughout that time thick, greenish pus was draining from the wound, so that the patient required constant care and a change of dressings twice daily.

I have gone into this history in some detail to impress upon you the seriousness of the condition from the patient's standpoint, and the futility of half-way measures of treatment. From December, 1916, when the splashing sound was first noticed in his chest, until June, 1919, a period of thirty-one months, this patient was absorbing toxins from an extensive area of infection. Throughout that time he was almost constantly under a physician's care, subjected to considerable expense, to great personal discomfort, and confronted with the serious possibility of permanent invalidism.

When he entered the hospital in June, 1919, thick green pus was draining from a silver tube introduced into the right pleural cavity in the sixth interspace. The skin about the wound was red and inflamed for a considerable distance. After injecting a few ounces of thin bismuth paste into the sinus a radiogram was made, which showed a cavity extending from the diaphragm to the level of the third rib, and compressing the lung to about one-third its normal size (Fig. 169, p. 478).

Under novocain anesthesia 1½ inches of the seventh rib were removed, the bismuth paste was washed out with sterile olive oil, and two Carrel tubes, threaded on silver wire, were introduced into the pleural cavity. Two-hourly instillations of Dakin's fluid were begun, and the bacterial count, which at the beginning of treatment was very high, gradually fell to zero.

On July 17th, twenty-seven days after admission, the patient left the hospital with the sinus in his chest about the size of a No. 15 catheter, and with a very thin serous discharge still present, which contained a few pus-cells, but no organisms on smear or culture. His general condition was much improved and he had gained 8 pounds in weight.

From July 17th until October 6th the patient returned to the hospital at first twice weekly and later three times weekly for change of dressings. At each dressing from 15 to 20 c.c. of 5 per cent. dichloramin-T in chlorcosane were injected with a sterile catheter, but the organisms gradually reappeared in the chest fluid, and at times the patient's afternoon temperature rose to 99.6° F.

On October 6th the patient again entered the hospital, and since that time, nine weeks ago, we have again succeeded in bringing the bacterial count to zero by the two-hourly instillation of Dakin's fluid.

While the patient was in the hospital in June and July, and following his discharge, we attempted to bring the compressed lung out to the chest wall by positive pressure—*i. e.*, by having the patient force the water from one demijohn into a second by blowing into the former through a tube. When he returned to the hospital the second time we combined this exercise with suction from without, with the Perthes apparatus. In spite of these procedures we have not succeeded in diminishing the size of the cavity in the chest or of rendering it impotent as a source of future trouble. We have been able to counteract the infection, and so bring about a considerable improvement in his general condition.

The treatment of these two patients presents one of the most difficult problems you will have to meet in your early years of practice, and it is this problem I wish to discuss with you. In the first place, let me emphasize the fact that our failures in the treatment of empyema, as well as in the treatment of other diseases, are due more to our lack of application of surgical principles than to mistakes in operative technic. One fault with us as physicians is that we tend to apply a routine treatment in all cases. We acquire the habit of using Brown's or Jones' or Smith's operation, without stopping to realize that no one method of treatment is applicable to all cases. We fall into the error of always aspirating or resecting a rib, or using some single method of establishing negative pressure, instead of studying the changed physiology of the respiratory tract, and the character of the pathologic process going on in the lung and pleural cavity.

At the beginning of the epidemic of empyema which occurred during the war primary resection of a rib was the routine method of treatment; later aspiration became the method of choice. We now find certain men who say all cases of empyema should have rib resection and drainage; while others say that all patients with empyema should be treated by aspiration. It was my privilege to have charge of the work on empyema in this country during the war. At the time we assumed general supervision of these cases there were 980 patients with empyema, of whom a large percentage had drained for a considerable period of time. We began our work with the aid of a commission in each of the camps for the intensive study of every case, and with a general commission supervising the entire work. The result of our studies forcibly impressed upon us the fact that before instituting any method of treatment one must understand the pathologic condition present and the state of the patient's resistance, and then apply to that patient the particular method of treatment indicated.

In civil life a considerable number of our patients have empyema due to the pneumococcus. A smaller group, but still a considerable number, have empyema due to the streptococcus, while at other times it may be due to the staphylococcus or the tubercle bacillus. The inception of the disease and the pathologic reaction are essentially different in the different types. With a streptococcic infection a patient is ordinarily suffering not alone from an infection of the pleural cavity, but from a serious systemic infection as well, and frequently from an associated involvement of the other serous cavities of the body. With pneumococcus infections, although the patient has a systemic infection, the chief pathologic change is in the lung and pleura. With streptococcic infections the local pathologic condition consists in the presence of an exudate containing many streptococci, a few leukocytes, and a considerable amount of fibrin. Because of the virulence of the infection there is no attempt on the part of the pleura to form adhesions by the reduplication of its cells. At the end of the first week we will find the pleural cavity filled with a large amount of fluid, the lung collapsed, and no adhesions present. At the end of the second week, if the patient survives, the virulence of the infection diminishes and the process gradually becomes localized. During the third week reduplication of the pleural epithelium begins, and adhesions are formed. With pneumococcic infections, on the other hand, adhesions develop early, which wall off the pus cavity and definitely localize the pathologic process. With streptococcus infections, since the pleural surfaces are not adherent, the lung is compressed toward the mediastinum and away from the diaphragm; with pneumococcus infections the formation of adhesions may prevent, to some extent, retraction of the lung. The tuberculous type may resemble either of the above types, for the pathologic process depends to a considerable extent upon the addition of a mixed infection from the lung and bronchioles to the sterile effusion previously present. In this type the frequent presence of a bronchopleural fistula adds a new complication to the difficulties of treatment.

The obvious conclusion is that the early stages of a streptococcic empyema demand a different plan of treatment from a pneumococcic empyema. A patient with a streptococcic empyema, with a systemic infection, with a possible involvement of other portions of the body, will not stand any severe surgical operation. If the chest is opened and drained, an open pneumothorax is created, which increases the difficulty rather than decreases it, since it adds tremendously to the handicap under which the heart and lungs are already working.

In this connection I wish to call your attention to the splendid experimental work carried out by Graham and Bell, of the Empyema Commission.[1] They showed that, contrary to the generally accepted belief, the pressure in the two pleural cavities when one or the other is opened is practically equal; that instead of being fixed and rigid, the mediastinal structures, unless their mobility is partially limited by pre-existing adhesions, readily move to one side or the other, and so permit an approximation of the pressure within the two pleural cavities and of the compression of the two lungs. In other words, if we speak of the affected side and the sound side we are deceiving ourselves, for the compression of the two lungs is approximately equal, and the conception of one lung working without let or hindrance, in spite of an extensive pneumothorax on the opposite side, is erroneous.

They showed further that the danger from an open pneumothorax depended directly upon the size of the opening into the pleural cavity. If the opening was small, the increased pressure within the pleural cavity might be compensated for by an increased rate and amplitude of respiration; but as the size of the opening approached that of the tracheal inlet and the competition of the two for air became equal, not even the greatest possible rate and amplitude of respiration would suffice to draw sufficient air into the compressed lungs. If, moreover, the size of the tracheal inlet were diminished by reason of a tracheobronchitis, with its accompanying edema and exudation, the margin of safety became markedly reduced. If, on the other hand, an open pneumothorax, spontaneously or artificially created, were converted into a closed pneumothorax, respiratory embarrassment ceased almost immediately. This fact has been shown clinically innumerable times, but I do not believe the physiologic problem involved was correctly appreciated before Graham and Bell carried out their experiments.

---

[1] Graham, E. A., and Bell, R. D.: Am. J. M. Sci., 1918, clvi, 839–871.

I need only mention two types of cases to emphasize the clinical importance of these observations. You who have been interested in war surgery of the lungs and pleura will remember the emphasis laid upon the importance of closing gaping wounds of the chest at the earliest possible moment, at the regimental aid post, or even on the field itself, with no equipment other than a stout curved needle and a bit of catgut or even ordinary cord. We did not quite appreciate the significance of it, but we recognized the fact that an open pneumothorax with a big opening into the pleural cavity meant speedy asphyxia and death. Another striking example of the same fact occurred here in the hospital just after the first patient was operated upon for the first time. Following the resection of a rib a tube was placed in the pleural cavity for drainage, and to this tube was attached a longer tube, which was to be connected with the suction apparatus. The suction apparatus was not ready for use, so the end of the tube was allowed to hang in an open bottle for some hours. At the end of that time, when she was seen by the surgeon, she was breathing about 50 times per minute and was evidently in great respiratory distress. In other words, she was attempting by rapid and deep breathing to counteract the abnormal positive pressure upon the lungs, and get enough oxygen into the alveoli to permit aëration of the blood. By simply adding enough water to the bottle to cover the end of the rubber tube the open pneumothorax was converted into a closed one, and her respiratory embarrassment was relieved almost immediately.

The principles of the treatment of empyema include three essential factors: first, the removal of the infectious material; second, the sterilization of the infected cavity; third, the obliteration of the cavity. With a streptococcic infection complicated by general sepsis it is important that the fluid be removed in such a manner as to prevent the entrance of air into the chest cavity. The general condition of these patients is usually so serious and the lung capacity already so greatly diminished by the antecedent pulmonary involvement that even a small opening into the pleural cavity with the production of an open pneumothorax may prove a fatal strain upon the patient's lowered respiratory function.

In individual cases it may be advisable simply to aspirate enough fluid to lessen the pressure on the heart. As the patient's resistance increases, more and more fluid may be removed, until finally it is possible to remove the entire accumulation with safety, but always in such a manner as will prevent collapse of the lung. A certain proportion of these cases, if aspirated under aseptic conditions, will never need resection. A large number will need further treatment. The great disadvantage of repeated aspiration is the difficulty of avoiding the development of a secondary infection. Aspiration with repeated puncture is not without danger to the patient. It is not uncommon at postmortem examination to find a puncture of the diaphragm with peritonitis, or a puncture of the pericardium with a resulting pericarditis. It is very easy to pass the needle through the pleural cavity into the lung, with a resulting pulmonary abscess on one hand, or the secondary infection from the lung of a sterile effusion on the other. For this reason paracentesis should always be carried out with a small trocar which permits the stylet to be withdrawn just before the parietal pleura is punctured. The use of a sharp-pointed needle with a long beveled end should be scrupulously avoided.

As the general condition of the patient improves he gradually develops a resistance to the infection, more and more white blood-cells are thrown out, so that the pleural fluid, instead of being thin and turbid, becomes distinctly purulent. At the same time adhesions develop between the parietal and visceral pleura which help to limit the pathologic process, and which may prevent to some extent retraction of the lung and mediastinum in the event the chest is opened.

After eight or ten days it may be wise to introduce drainage between the ribs or to resect a rib. Drainage between the ribs is a satisfactory procedure in an individual with wide intercostal spaces, which ordinarily means that the individual is in the middle decades of life. Under such conditions we can make an incision under local anesthesia between the ribs, insert tubes, apply aspiration, and obtain a satisfactory recovery. In younger individuals or in those in whom the chest is not well developed puncture between the ribs and drainage is not particularly satisfactory, because the ribs close down and compress the tubes.

Dr. Diederich,[1] of this city, while working with empyema cases at Camp Pike, Arkansas, devised a very satisfactory trocar for introducing intercostal drainage. A curved side arm permitted the chest fluid to be aspirated when the stylet was withdrawn; and the bore of the instrument was sufficiently large to permit the introduction of a rubber catheter which was left in the pleural cavity after the trocar was removed, and through which the pleural cavity could be irrigated with Dakin's solution. In addition to offering a simple method of entering the pleural cavity, it afforded an air-tight closure about the tube after the trocar was withdrawn.

If the fluid is thick and can be aspirated only with difficulty, it is wiser to resect a portion of a rib and, if possible, gently explore the cavity with a finger. Not infrequently pockets of pus may become partially shut off from the main cavity by newly forming adhesions, and unless these are broken down drainage will be incomplete.

---

[1] Surg., Gynec., and Obst., 1919, xxviii, 362–371.

This operation should always be carried out under local anesthesia, for the administration of a general anesthetic heaps an extra load on the already overburdened heart. You will have no difficulty if you will work gently and avoid pulling on the soft tissues. You will remember that the periosteum is very sensitive and should always be separately injected before you begin to reflect it from the rib.

Drainage should be instituted over the point where the pus is located, and in such a way that the site of drainage is at the most dependent portion of the pus cavity when the patient is in a comfortable position. Many text-books state that drainage should always be instituted in a certain place, for instance, in the seventh interspace along the midaxillary line. It is much more important to determine by careful physical examination and with the help of the *x*-ray the lowest point of the infected area with the patient in the most comfortable position, and to establish drainage at that point. If after opening the pleural cavity you should find that you are some little distance above the lowest level, it is wiser to make a second opening than to attempt to drain the infected cavity from above. The objection that the diaphragm may press against the tube and prevent drainage is more theoretical than practical. I have never seen but one case in which I thought that accident occurred.

The institution of drainage does not remove all the sources of difficulty. It allows free pus to escape, but it does not remove the plastic exudate which covers the walls of the cavity. In streptococcic empyemas this exudate contains a large amount of fibrin. In the more chronic conditions the exudate becomes organized, with the formation of dense adhesions between the visceral and parietal pleura. Many years ago surgeons advocated opening the chest wall and removing the exudate by scraping it out. Patients with empyema, however, have not sufficient vitality to stand such a severe operation, nor can we be sure that we are removing only diseased tissue, and not breaking down nature's barrier to the spread of the infection. If we could find some means of digesting the exudate and destroying the organisms without injuring the healthy tissues or lowering their reaction, such a method would undoubtedly hasten the process of recovery. Such a method is available in the use of Dakin's solution. This solution has the property of dissolving organic matter, including, of course, the micro-organisms we call bacteria. If it is introduced into an empyema cavity it will dissolve the fibrin and chronic inflammatory deposit and destroy the organisms. If, then, we are able to dissolve this fibrinous exudate which harbors the bacteria and kill the organisms present, we have fulfilled the second essential—the sterilization of the infected cavity. It now remains for us to obliterate the cavity.

The obliteration of the cavity must be accomplished either by bringing the lung out to the chest wall or by bringing the chest wall to the lung. The lung may be brought out to the chest wall either by the establishment of a negative pressure in the pleural cavity or by positive pressure within the lung. Originally the latter was attempted by having the patient blow against pressure, the so-called "bottle blowing," but this method only pushes the lung out against the parietal pleura for a few moments at a time, and after the pressure is released the lung sinks back to its former position.

The establishment of a constant negative pressure offers a much better chance of success, for if the pressure is maintained, the lung is constantly pulled out until it is restored to its normal position, or until adhesions between the parietal and visceral pleura permit the obliteration of the cavity. In one stage of the pathologic process one method may succeed, while another may fail. Under normal conditions a negative pressure of 7 mm. of mercury will be sufficient to bring out the lung, but if many fibrous adhesions have been formed it may require a negative pressure of 20 or 30 mm.

Over thirty years ago the siphon method of treatment was introduced. A tube was placed in the chest wall and the connection between the tube and the chest wall made air-tight. The contents were siphoned off, but the walls of the cavity were not sterilized nor was the compressed lung drawn out to the chest wall.

The use of the water pump for producing negative pressure was suggested by Perthes ten years later, and still constitutes the most effective method I know of for drawing the lung out to the chest wall. In the first case I showed you we are now producing negative pressure in the pleural cavity by this method. The principle of the Perthes water pump is this: The drainage-tube in the chest leads to a bottle with three glass tubes passing through its rubber stopper. To the second tube is attached a rubber hose coming from the pump, and to the third a mercury manometer to indicate the negative pressure in the pleural cavity. The suction exerted by the aid of the pump exhausts the air from the bottle. The negative pressure in the bottle is transmitted to the pleural cavity, and the bottle serves as well to catch the secretion aspirated from the cavity.

The same method has been utilized in the Bethune apparatus which we have here. It consists of two large bottles so placed in a revolving frame that they are end to end, with the stoppered ends proximal to one another. One of the bottles is almost full of water, the other empty. Each has a rubber stopper with its three openings as in the simple Perthes method. One of these is a direct connection between the bottles, so that the water runs from the uppermost bottle into the lower. The rate is regulated by a screw clamp on the short rubber connecting tube. The second tube in the bottle also extends just through the cork and is connected to a glass tube on the side of the frame which serves as the manometer. Since this is a water manometer, we must have 13 mm. of water in this tube for each millimeter of mercury ordinarily required. The third is a long glass tube extending into the bottle to a point above the water level; the corresponding tube in the lower bottle is connected to it by a **T**-shaped tube. A long rubber tube runs from the side arm of this **T**-tube to the intermediate drainage bottle. A tube extends from the drainage bottle to the patient's chest. The water dropping from the uppermost bottle into the lower at a regulated rate produces a vacuum, and consequently suction on the tube connected through the drainage bottle to the chest. When the upper bottle is emptied we simply reverse the frame and the position of the bottles. This apparatus renders unnecessary the attachment to the water faucet, and makes a portable arrangement which may be easily moved to any part of a ward.

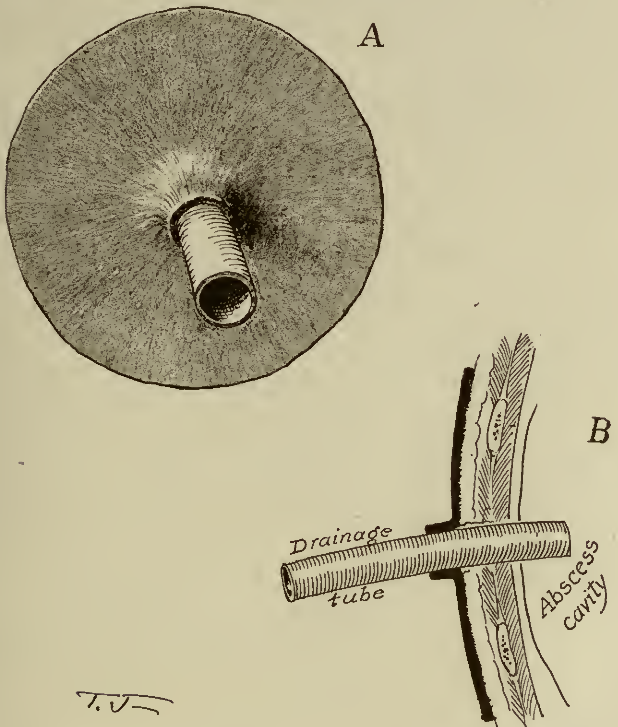

Fig. 164.—Rubber patch for securing air-tight closure around drainage-tube in pleural cavity.

To maintain a negative pressure within the pleural cavity it is important that there should be an air-tight closure about the drainage-tube passing into the chest. One simple method of securing such a closure is to draw the rubber drainage-tube through a rubber patch 3 to 4 inches in diameter, and cement or vulcanize the two together in such a way that the union is air-tight (Fig. 164). The drainage-tube is passed into the pleural cavity, and the under surface of the patch, which lies flat against the chest wall, is cemented to the skin by ordinary rubber cement. The patch should be removed and resterilized after five or six days, so that no irritation of the skin may occur underneath it.

For the introduction of Dakin's solution a small tube is passed into the pleural cavity through the larger tube. Our method of procedure is to shut off the suction apparatus by a clamp, introduce Dakin's fluid through the smaller tube, and after a fifteen-minute interval start the suction again. The small tube is always clamped off except at the moment the Dakin fluid is being introduced. In this way the negative pressure is constantly maintained, and the cavity is bathed with Dakin's fluid for fifteen minutes of every two hours. Even that brief period probably exceeds the length of time for which the solution retains its effectiveness under ordinary conditions.

In chronic cases with marked thickening of the parietal and visceral pleura it is advisable to use a 2 per cent. solution of Dakin's fluid instead of the 0.5 per cent. solution ordinarily used. If continued for three or four days this procedure will help to destroy even a firm fibrous wall of inflammatory tissue. Obviously great care must be used to prevent irritation of the skin of the chest wall at the site of drainage.

If complete sterilization can be secured and maintained it is permissible in certain cases to dissect out the fistulous tract and close the thoracic opening. In a fair proportion of cases this procedure will be followed by healing without further complications.

There is a certain group of cases in which in spite of the institution of a negative pressure within the pleural cavity the lung cannot be brought out to the chest wall. This fact is due to the presence of one or more complicating factors: first, there may be a non-collapsible cavity due to the long duration of the process; second, there may be imperfect drainage; third, there may be a tuberculous process in the pleura; fourth, there may be tuberculous involvement of the lung, a pulmonary abscess, or a pleurobronchial fistula; fifth, there may be an osteomyelitis of the ribs over the point of drainage. Less commonly there may be a foreign body present within the chest cavity, such as a piece of rubber tubing which has slipped in during a change of dressings; or a subdiaphragmatic abscess may be present. The cause, whatever it is, must be sought and removed. If there is improper drainage, our tube has not been inserted properly. If there is osteomyelitis of the rib, the diseased bone should be removed. If the plastic exudate prevents the lung from expanding, we must remove it, and then, by the institution of a negative pressure, obliterate the cavity. It is said by some surgeons that chronic empyema never requires resection of the ribs and collapse of the wall. To my mind this is just another one of those universal beliefs that should be avoided. I believe that 9 out of 10 of the chronic cases can be cured by removing the cause of the long-continued suppuration, sterilizing the cavity, and drawing the lung out to the chest wall, but once in a while there is some reason why this cannot be done, most commonly because of the formation of a thick non-yielding wall of fibrous tissue over the visceral pleura, developed during the months when the disease process was allowed to continue with no attempt to establish a negative pressure and draw the lung out to the normal position.

In this particular case we have conscientiously attempted to obliterate the cavity by the less radical methods at our disposal, and have failed to do so. We have been able for a number of weeks to keep the cavity "surgically sterile," as shown by the fact that there have been no bacteria present in the smears of the aspirated fluid; but we have not been able to reduce the size of the cavity. Therefore we must resort to some other method of treatment.

There are a number of surgical methods which have been devised for obliterating a cavity in the chest. One method is that devised by Schede, which consists in the removal of a considerable number of ribs, which permits the chest wall to collapse and the parietal pleura to fall against the visceral pleura. Other surgeons have transplanted muscle, skin, or pedicled flaps into the pleural cavity. Robinson, in particular, has presented some excellent contributions upon this subject. The operation we will perform today consists of a combination of the operations of Schede, Robinson, and Ransohoff, in that we will resect the ribs, permit the collapse of the parietal pleura, transplant a flap of muscle, and make cross-sections of the surfaces of the visceral pleura as suggested by Ransohoff.

OPERATION

The patient should ordinarily be operated upon under local anesthesia. Schumacher makes an injection of the nerves at the angle of the rib, while Kappis, of the Kiel Clinic, injects the nerve at the point of emergence from the spinal column. A combination of these methods has been used in the present case. A U-shaped incision is made through the skin, fascia, and attached muscles, from the lower border of the pectoralis major in the midclavicular line down to the eighth rib and upward along the vertebral border of the scapula. By blunt dissection this entire mass is detached from the chest wall and raised upward (Fig. 165). The bleeding points are ligated. The periosteum of each rib is incised and separated from the rib with a periosteal elevator. Beginning at the lower part of the uncovered area, the seventh rib is cut at the costochondral junction, lifted up, and broken off as far back as possible (Fig. 166). This is an essential part of the technic, for the rib breaks much farther back than it can be cut with a bone-cutting forceps. With a finger in the cavity we now outline its interior to determine how far anteriorly the other ribs should be cut, since it is essential that the ribs should be cut anteriorly and broken posteriorly beyond the margin of the cavity; otherwise a shelving edge will be left that will prevent collapse of the parietal pleura. We now remove the eighth and ninth ribs and the sixth, fifth, fourth, and third, successively. We then make a vertical incision through the parietal pleura, over the middle of the uncovered area, and expose widely the interior of the cavity. At the upper end of the cavity we find a small fistulous opening leading to a bronchus. It is necessary that this should be obliterated in some way or the discharge will continue. This we do by dissecting out the fistula with a scalpel, and thoroughly cureting it where it cannot be reached by dissection.

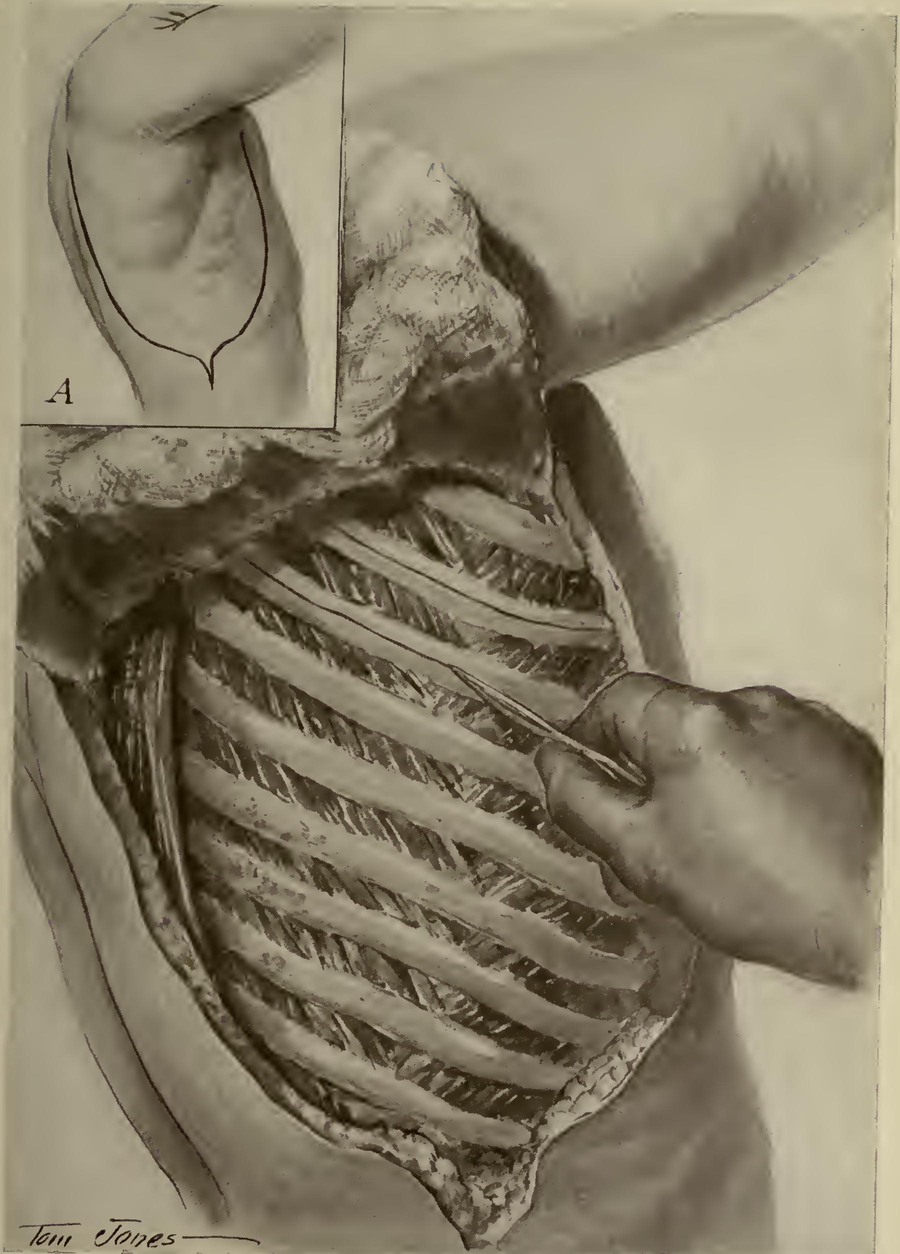

Fig. 165.—Operation for obliteration of empyema cavity. Incising the periosteum of the ribs.

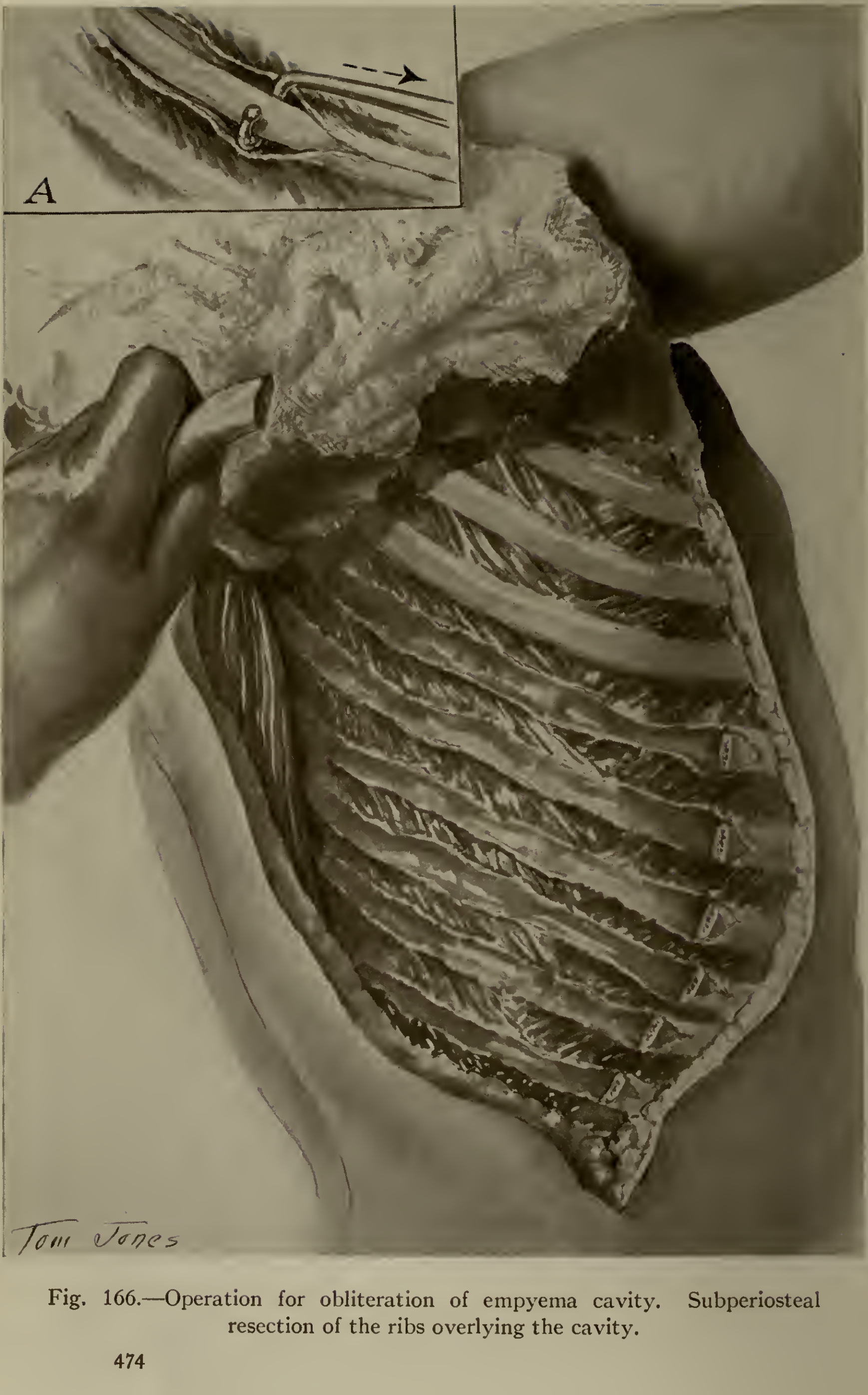

Fig. 166.—Operation for obliteration of empyema cavity. Subperiosteal resection of the ribs overlying the cavity.

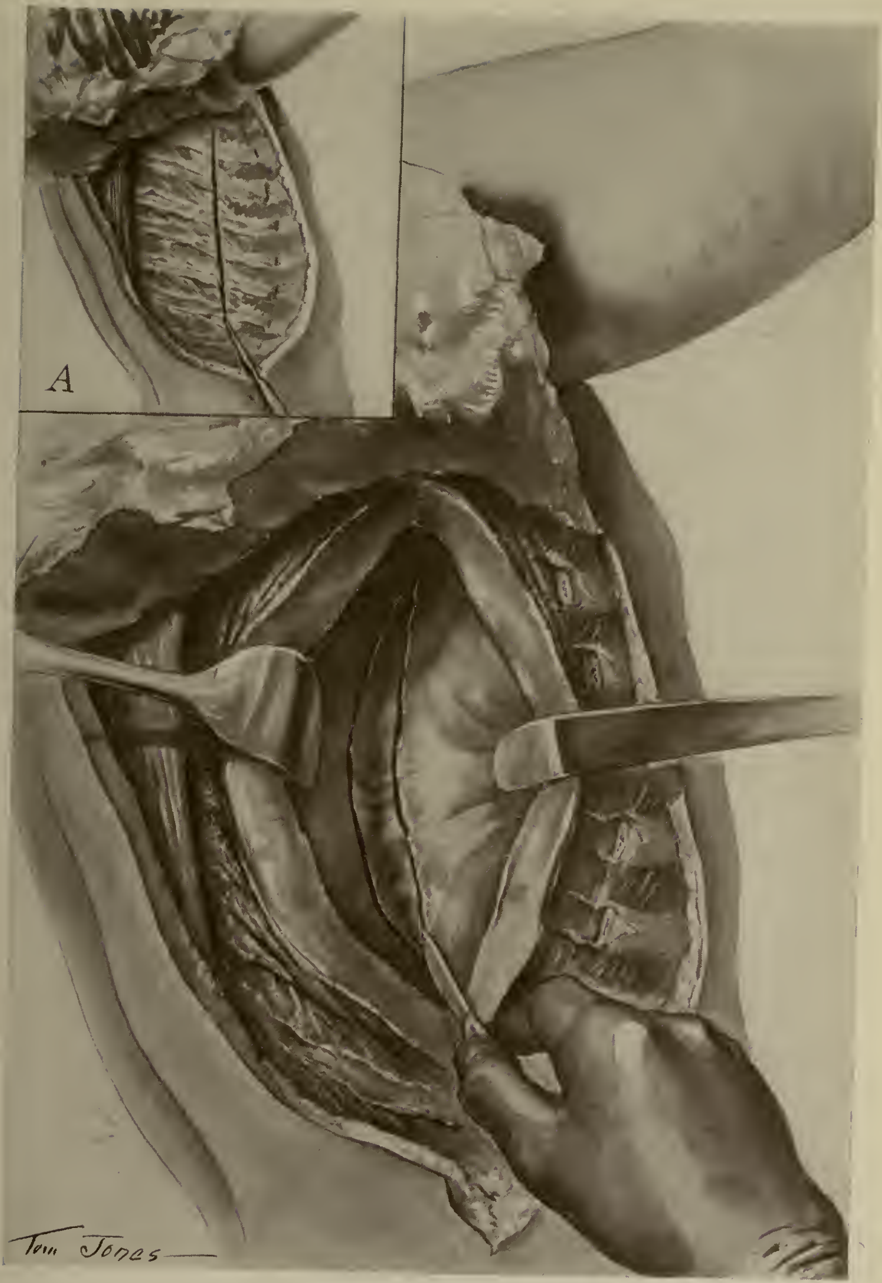

Fig. 167.—Operation for obliteration of empyema cavity. Removal of **V**-shaped section of tissue at the posterior angle of the cavity to permit complete collapse of its walls.

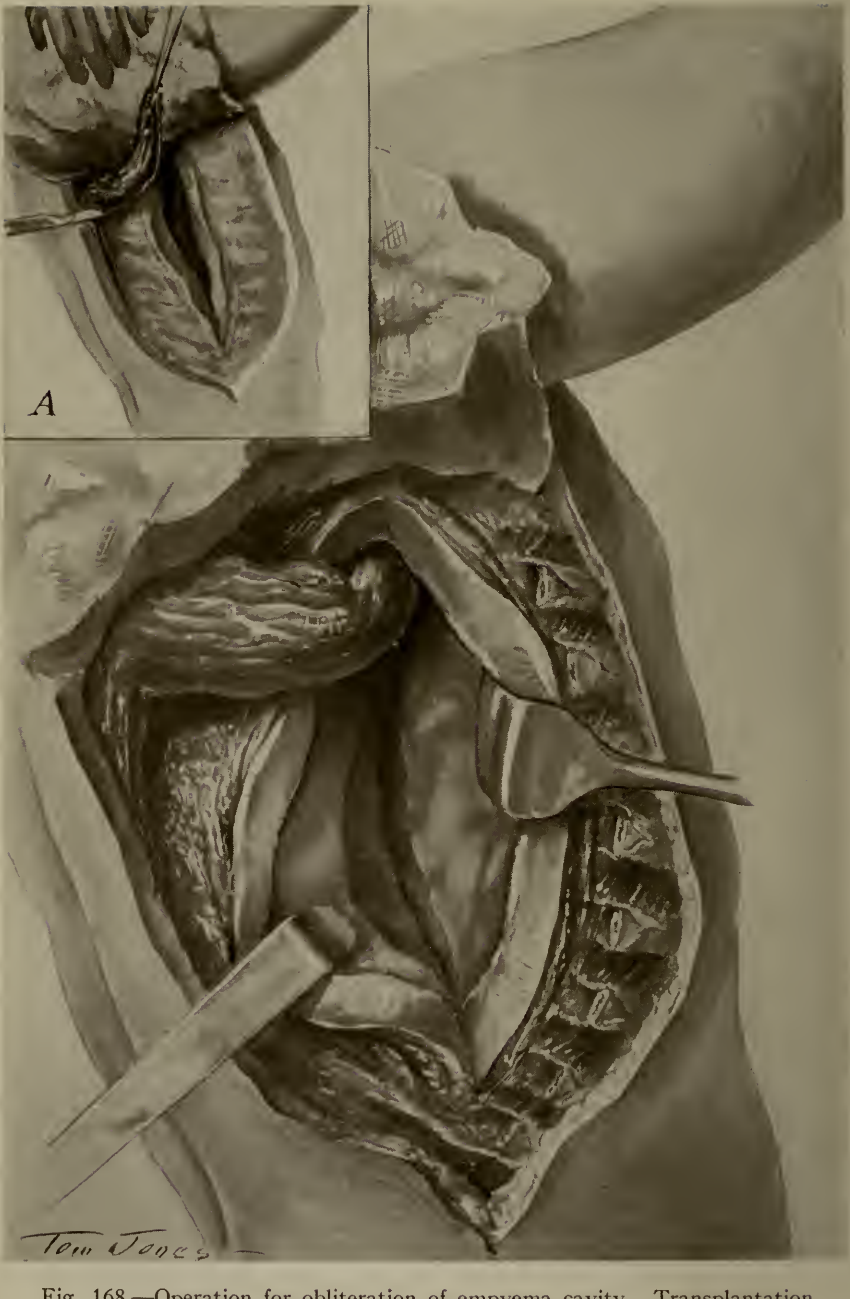

Fig. 168.—Operation for obliteration of empyema cavity. Transplantation of pedicled muscle flap into pleurobronchial fistula.

When now we permit the parietal pleura, freed from its bony support, to fall against the visceral pleura we note that at the anterior and posterior margins of the cavity, where the parietal layer is reflected into the visceral layer, owing to the thickness and rigidity of the fibrous wall, the surfaces do not come together even under pressure. It is necessary, therefore, to remove at these angles a **V**-shaped section so that the walls will fall together without pressure (Fig. 167). We now make cross incisions in the visceral pleura with a scalpel to favor the proliferation of fibroblasts, so that there will be an early fibrous adhesion of this visceral to the parietal pleura. This also permits the visceral pleura to expand more rapidly under intrapulmonary pressure. A section of the latissimus dorsi is now detached at the posterior margin of the wound and a pedicled flap of muscle turned into the bronchopleural fistula (Fig. 168). The bleeding points are carefully ligated. A drain is inserted at the point at which we have inverted this pedicle, and a second drain is inserted at the lower end of the wound. The muscles and skin are sutured at their original site by interrupted silkworm-gut sutures.

Especial care should be used to dress the wound with pressure at the site of operation, so that there will not be an accumulation of blood underneath the flap. Not long ago one of my patients suffered a fatality which seemed to be directly attributable to failure to observe this precaution. These patients frequently suffer from shock, particularly if there has been much oozing. Great care should be taken to keep them warm and quiet and to fill them with fluids. If necessary, one should not hesitate to give them a transfusion of whole or citrated blood. They must be carefully watched for the accumulation of any fluid underneath the flap and for the development of postoperative pneumonia.

AFTER-HISTORY

The patient made an uneventful recovery from the operation, but continued to drain thin pus from the lower end of the wound. A small tube was placed in the sinus and Dakin's fluid instilled at two-hour intervals for about ten days. At the end of a month

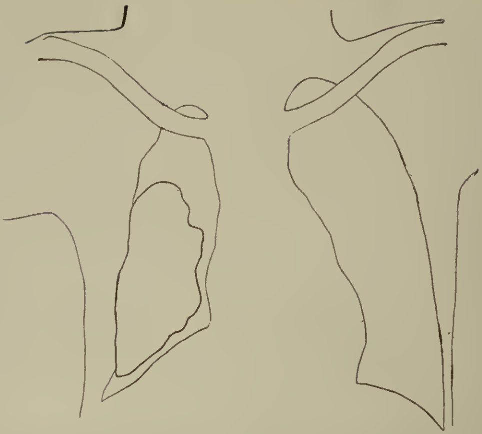

Fig. 169.—Outline of chest (made from Roentgen plate) in Case II, showing bismuth in empyema cavity before operation.

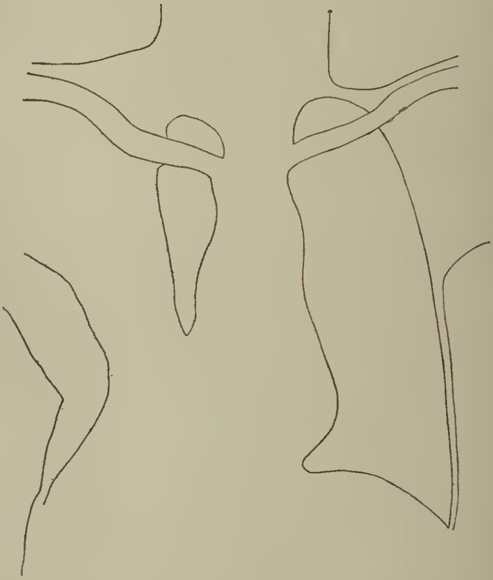

Fig. 170.—Outline of chest (made from Roentgen plate) in Case II, showing collapse of chest wall after operation.

the wound had completely healed, the discharge had ceased, and the patient had gained 12 pounds in weight (Figs. 169, 170).

During the operation I mentioned a patient who had died following operation. I wish to speak about him again, for I would not like you to carry away the impression that no fatalities follow this type of operation. Every surgeon meets with some fatalities, and as students you should recognize the possibility of a serious outcome, and the fact that the mortality ranges from 5 to 8 per cent. The patient I refer to is one we operated upon some time ago.

He (L. V., Wesley Hospital, No. 81206) had suffered from chronic empyema following pneumonia for over four years. In spite of our efforts to cure this by the methods we have already described, the empyema cavity continued to discharge thick pus. He was operated upon after the method I have shown you today. Following the operation, owing to the fact that a tight compression bandage was not placed over the flap, a large accumulation of blood took place underneath the flap. This was later evacuated, but the oozing had been so extensive that it was deemed advisable to do a blood transfusion. After the transfusion the patient seemed to make satisfactory progress for four days, when he developed a severe coughing spell, with the expectoration of some sanguinopurulent fluid. The following day his temperature began to rise, the evidences of bronchopneumonia gradually appeared in the other lung, and he died on the seventh day from an extensive bronchopneumonia. The postmortem findings indicated that the involvement of the lung began with the aspiration of fluid through the open pleurobronchial fistula. I believe this outcome might have been avoided had it not been for the accumulation of blood which was permitted to take place underneath the flap.

The first patient whom I showed you has now been placed under our care, so that we can definitely control the treatment. We believe that by the aid of Perthes' apparatus we can establish a negative pressure within the pleural cavity, and draw the compressed lung out to the chest wall. The chest wall about the site of drainage has become raw and excoriated, due to the escape of the infected secretion over the skin. In fact, there is a limited area of gangrene immediately about the opening in the chest.

For that reason we cannot apply our rubber patch at this time, but will attempt to secure an air-tight closure by laying sterile gauze snugly around the tube and strapping it tightly to the chest wall.

In connection with these cases I wish to present to you this patient upon whom I operated three years ago by a slightly different procedure (C. B., Cook County Hospital, No. 594895, Fig. 171). He had also suffered from chronic empyema in which every endeavor was made to obliterate the cavity by ordinary methods without success. At operation we resected four ribs overlying the cavity, but did not uncover the cavity completely, as in the operation we carried out today. To obliterate the cavity this incision, passing downward and forward, was made and a

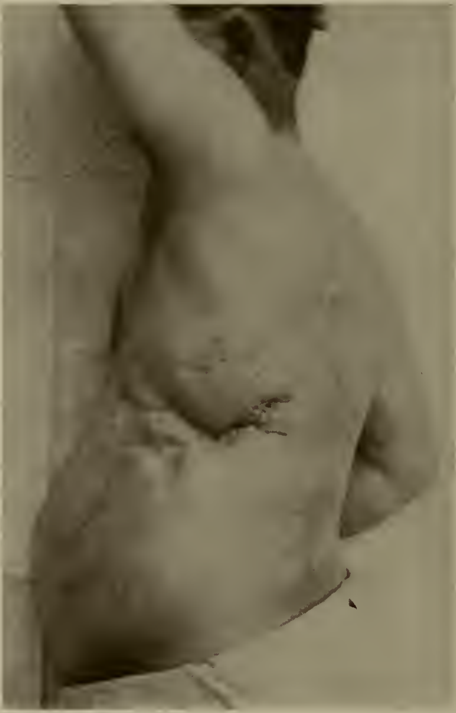

Fig. 171.—Photograph of patient (Case II) after healing had occurred.

large section of the latissimus dorsi, with a portion of the external oblique, was elevated and turned upward into the cavity. The wound was closed with the exception of a small area at the lower portion where drainage was instituted.

The patient made an uneventful recovery from the operation, but continued to drain pus from the wound for a number of months. To eliminate this repeated injections of bismuth paste were made, which after seven months permitted the wound to heal completely.

This case illustrates the fact that the method of transplanting a flap is not an adequate procedure if we cannot completely obliterate the cavity; and that in those patients in whom a small fistulous cavity persists, not produced by a bronchopleural opening, the injection of a paste which will obliterate the cavity and prevent an accumulation of pus will be ultimately followed by obliteration of the cavity through adhesions and the development of new granulation tissue. It cannot be expected, however, that all cavities treated by this method will eventually recover.

CLINIC OF DR. HERMAN L. KRETSCHMER

Presbyterian and Alexian Brothers Hospitals

CYSTIC DILATATION OF INTRAVESICAL PORTION OF URETER DUE TO PRESENCE OF A CALCULUS

Summary: A patient complaining of distress in bladder and rectum not relieved by correction of pathologic change in rectum. Diagnosis made through the combined use of the *x*-ray and the cystoscope. Cure by open operation.

The patient we have this morning is a physician, Dr. A., aged thirty-six, who has just been discharged from the Navy. The previous history shows that he was examined seven years ago with the Roentgen ray for the presence of stone in the urinary tract. The report given to the doctor was negative for stone. On December 11, 1917 a hemorrhoidectomy was performed at the Base Hospital, Fort Riley, but the symptoms were not relieved by the operation. The patient enters the hospital because of painful defecation, tenesmus, and painful urination.

The patient states that his present complaint dates from December, 1917. The first symptoms noticed were pain on defecation and pain during urination, which he states were not relieved by the operation at the Base Hospital. The painful urination has been more severe and more constant since his rectal operation. Walking and running aggravate the condition. The patient states also that running often causes severe pain immediately, and that sometimes the pain is relieved by defecation.

General examination was negative except for the presence of considerable adenoid tissue at the base of the tongue. The heart and lungs were negative; the abdomen was negative. There was slight tenderness over the right kidney.

Examination by Dr. B. F. Davis showed the presence of two rectal fistulæ.

Examination of the blood showed 22,500 leukocytes and 98 per cent. hemoglobin. Blood-pressure was systolic, 138; diastolic, 85. Urinalysis shows specific gravity 1030; acid reaction; no albumin or sugar; no blood; microscopically, a few hyaline and granular casts and leukocytes.

The patient was operated on by Dr. B. F. Davis on September 15, 1919. Two small fistulæ in the anterior wall and one in the posterior wall were dissected out and the remains of an old hemorrhoid removed.

The operation gave him partial relief from his symptoms. In view of the fact that he had some pus in his urine and urinary distress it was thought advisable to have an *x*-ray taken of the urinary tract. A culture of his urine at this time was negative. Examination of the bladder urine showed the presence of 155 leukocytes per cubic millimeter. Roentgen-ray examination of the kidneys and ureters was practically negative for the presence of stone. Examination with a plate made of the lower urinary tract showed the presence of a shadow at the right side nearly as large as a quarter. The shadow was round and was situated almost in the median line (Fig. 172). A tentative diagnosis of stone in the bladder was made from the *x*-ray plate, and it was then decided to verify this diagnosis with the cystoscope.

Cystoscopic examination was made on September 25, 1919. This failed to show the presence of stone in the bladder. The left ureteral orifice was normal; the right ureteral orifice was not seen. In its location was seen a swelling as large as a hazelnut. The surface of this swelling was covered with mucous membrane and was smooth and glistening. There were seen small vesicles on the surface of this swelling.

This case is interesting from several angles. In the first place, the patient had a definite history of having had trouble with his rectum, for which he was operated while in the service. This operation failed to give the desired relief, and when the patient entered Presbyterian Hospital Dr. Davis found he had two small fistulæ. These were operated upon and the patient had some relief as regards his rectal symptoms, but did not obtain relief from his urinary distress. It is a well-known fact that patients with rectal disease not infrequently have urinary symptoms, and doubtless many cases of indefinite or obscure rectal lesions are overlooked because of the fact that the patients' chief complaints are urinary in character and attention is directed to the urinary organs. These many times are negative, and the patient is then sent away with a diagnosis of neurasthenia. If the possibility of rectal lesions producing urinary symptoms would be more often borne in mind, no doubt careful rectal examination would amply reward one for the extra time and trouble spent in hunting for lesions of the rectum. The simple fact that many patients who are operated upon for hemorrhoids develop complete reten-

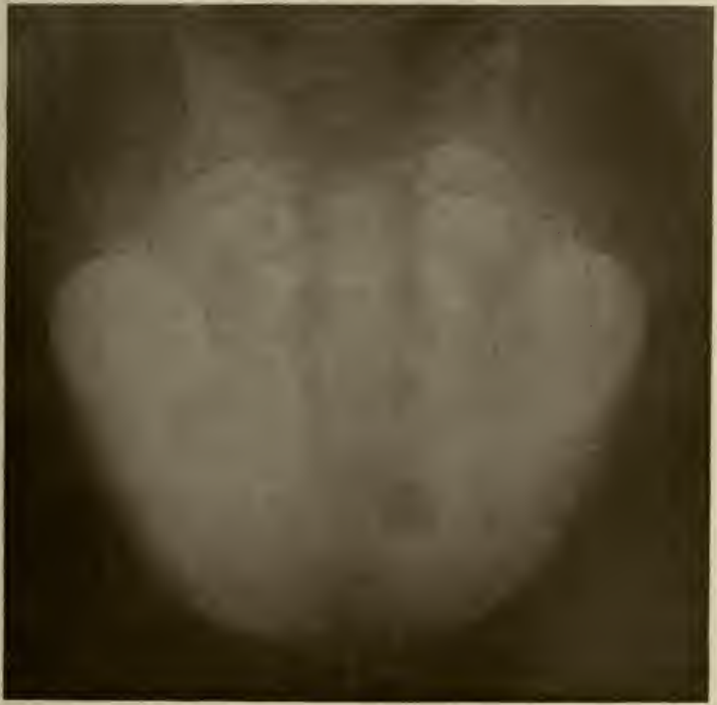

Fig. 172.—Stone in the ureter. The unusual shape and location of this stone would easily cause it to be confused with a stone in the bladder.

tion of the urine should not be lost sight of. I mean to say that when a patient is operated on for hemorrhoids and retention sets in after operation such cases are very common in the first place, and occurrence following operation, usually in the hospital, is something that cannot very well escape detection; but in the rare instances in which patients have urinary symptoms due to lesions in the rectum that are not obvious, the possibility of a rectal cause for the urinary symptoms is overlooked. In this type of case the differential diagnosis should include a careful examination of the rectum both by inspection with the proctoscope and by digital exploration.

The second point of interest is the presence of this shadow in the pelvis. From its size, shape, and position, and because of its association with urinary distress, one would be very apt to make a diagnosis of stone in the bladder, and, as a matter of fact, this is the diagnosis that I made when I first looked at the plate. Not relying, however, upon the *x*-ray findings alone, the patient was cystoscoped. In a previous clinic on stone in the bladder, its diagnosis and treatment, together with the advantages of examining each case of stone in the bladder with the cystoscope were fully discussed. Some of the points which were brought out in that clinic bear directly on this patient, and, as a matter of fact, though the evidence from the *x*-ray plate seemed conclusive, yet when the patient was cystoscoped no stone was found. Instead, the bladder was practically normal, with the exception of the changes around the right ureteral orifice. The edematous condition of a part of the bladder corresponding to the ureteral orifice was suggestive of a lesion of the right ureter. Cases of cystic dilatation of the ureter are very infrequent, and the impression was gained from the cystoscope that we were dealing with a cystic dilatation of the ureter. Occasionally there are cases recorded in the literature in which a diagnosis of cystic dilatation of the ureter has been made. However, I believe that a more appropriate diagnosis in this case would not be cystic dilatation in the true sense of the word. I believe, rather, that the changes that we see are due to the presence of a stone, and that that should be taken into consideration in discussing the differential diagnosis. The value of cystoscoping a stone case was very forcibly brought out in this case because, from the *x*-ray pictures, I had decided to do a litholapaxy. Had I not cystoscoped the patient before the litholapaxy was to have been carried out, it would have been very humiliating to introduce a lithotrite and then not be able to find and crush the stone, so that we were spared this humiliation by carrying out a cystoscopic examination.

With reference to the question of treatment in this case two forms will be considered: first, removal of the stone by means of an operating cystoscope; second, open operation. Because of our inability to see and locate the ureteral orifice and because of the rather large size of the stone, we deem it advisable to do an open operation instead of resorting to the intravesical procedure usually employed in treating stone in the ureter. I went over these two forms of treatment with the doctor, and told him that I thought the method of choice would be a suprapubic cystotomy, in order that we might be able to see better what we were doing with the bladder open rather than to resort to intravesical manipulations, especially in view of the fact that this edema had distorted the anatomy. To this he agreed, and this morning (9/27/19) we will attempt to remove this stone.

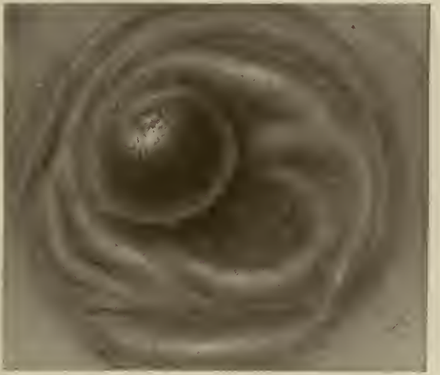

Fig. 173.—Drawing made at operation showing cystic dilatation of ureter due to presence of calculus.

The skin has been prepared in the usual manner and the bladder filled with boric solution. I am making a suprapubic midline incision down to the sheath of the rectus. I am dividing the sheath of the rectus and separating the muscles by blunt dissection. By means of gauze dissection the prevesical fat is being removed from the bladder, and with a scalpel the bladder is opened in the usual manner. In the region of the right ureteral orifice is a bulging as large as the end of my thumb (Fig. 173). This mass is very edematous. I open into this mass and expose the stone. The stone is removed and with scissors and forceps I am removing a large amount of this edematous tissue. A large ureteral catheter is now passed up into the kidney without any difficulty or obstruction. We are closing the bladder with continuous sutures, inserting a small drain. The rectus sheath is closed with continuous catgut. A small wick of iodoform gauze is placed in the space of Retzius. The skin is closed with silkworm-gut and silk.

Postscript.—The patient was discharged from the hospital October 11, 1919 with the wound completely healed.

METASTATIC PROSTATIC ABSCESS

Summary: Diagnosis of abscess of the prostate. Rarity of metastatic abscess. Treatment—the perineal route.

THE patient we have for operation this morning is Mr. R. U., aged forty-eight, by occupation a milk dealer. His previous history is negative except for the fact that he had empyema fifteen years ago. Four weeks prior to entering the hospital he developed osteomyelitis of the index-finger of the right hand, which was opened and treated with wet dressings. Two weeks later he entered the hospital with the following history:

He has complete retention of urine, that is, he is unable to empty his bladder, so that it has been necessary to catheterize him twice a day for the past week. He states that two weeks ago he was suddenly seized with frequency of urination, so that he was obliged to urinate ten or twelve times during the day and five or six times at night. Associated with this frequency he also had some pain, which was located in the region of the rectum and radiated toward the base of the bladder. There gradually developed some difficulty in urinating, so that the patient has been obliged to strain more and more, until at the present time he is unable to urinate at all. One week ago he began to have attacks of chills and fever several times a day. For the past four or five days he has had some perineal tenderness as well as a dull pain located in the rectum.

Physical examination is negative except for the presence of a suppurating wound of the index-finger.

Examination of the urine, August 21, 1919, showed specific gravity 1022, turbid; albumin, pus, and blood present.

The blood examination showed 20,000 leukocytes. The Wassermann test is negative and the gonorrheal complement test is negative.

On rectal examination the prostate cannot be distinctly outlined owing to the presence of an enormous, soft, fluctuating swelling that extends as high as the finger can reach. Rectal examination is very painful. The seminal vesicles cannot be felt.

The blood-culture has remained sterile.

From these findings one has no hesitation at all in making a diagnosis of metastatic abscess of the prostate. Abscess of the prostate usually occurs as a complication of a gonorrheal infection of the urethra. Abscess of the prostate as a complication of gonorrheal urethritis is not of common occurrence; still it does occur much more frequently than metastatic abscess of the prostate. Occasionally one sees an abscess of the prostate that is the result of a urethral stricture. Not infrequently one is able in these cases to elicit a history of rather recent urethral instrumentation, such as the passage of sounds. Metastatic abscesses of the prostate are rare. One does not read very much about them in the literature. In this case the relationship between the abscess and the presence of infectious osteomyelitis of the finger seems to be clear enough, but in order to establish the relationship it will be necessary for us to culture the secretion from the finger and also the pus from the prostatic abscess.

As a rule, little difficulty is experienced in the differential diagnosis. Patients with an abscess of the prostate complain of symptoms referable to infection. There is the presence of fever, which sometimes may be as high as 103° or 104° F. Often there is the association and history of repeated attacks of chills and fever, just as occurs in this patient. If, for example, this patient did not have a lesion of the finger, the presence of chills and fever would direct our attention to the fact that he was having some infectious process somewhere. If a patient comes in with no definite lesion and then develops chills and fever, the prostate is not very often thought of as being the source of the chills and fever. Added to this history, there frequently is a definite urinary history, such as painful urination, which goes on for a few days or a week. These symptoms gradually increase in severity and the patient experiences more and more difficulty in emptying his bladder, until finally complete retention supervenes, so that the patient must resort to the use of the catheter. In young men with acute gonorrheal urethritis and in whom acute retention of urine develops one should always think of the possibility of an abscess of the prostate. A careful examination will either demonstrate the presence of or exclude an abscess of the prostate. These cases, of course, require relief, and it becomes necessary to catheterize, in spite of the fact that there may be present a profuse urethral discharge.

Abscess of the prostate is not always as simple and easy to diagnose as it is in this case. As I mentioned previously, there may be no symptoms to direct our attention to the prostate and hence, rectal examination is not made, so that many of these abscesses are overlooked. It has been difficult in some instances to exclude benign hypertrophy of the prostate. Indeed, there are cases on record in which abscesses of the prostate were operated upon under the mistaken diagnosis of benign hypertrophy. It is easy to see just why this differentiation would be difficult. An abscess of the prostate may have one of three possible terminations: first, the abscess may go on to resolution; second, it may rupture. Most abscesses of the prostate rupture into the urethra or rectum, occasionally into the bladder, above the bladder and suprapubic area, or alongside the rectum. Doubtless many so-called ischiorectal abscesses are prostatic abscesses, which are erroneously diagnosed as ischiorectal abscesses. Third, the abscess is opened by operation. In a certain number of instances one may be able to rupture the abscess or cause it to rupture into the urethra by means of the finger in the rectum. This may be done with or without the presence of a sound in the urethra. Cases have been reported in which abscesses have pointed into the urethra and were opened by fulguration. Formerly some of the abscesses were opened by an incision in the rectum in cases in which the abscess pointed into the rectum. As a rule this route for attacking an abscess of the prostate is rarely followed. As a rule, these abscesses can be opened through the perineum in a simple way, and it is our intention to open this abscess of the prostate this morning through the perineum.

In view of the fact that the most prominent part of the abscess seems to be in the left lobe, we make an incision in the perineum on the left side. The incision which I am employing is that usually employed in performing a perineal prostatectomy. After incising the skin and superficial fascia, the blunt dissection is carried down to the abscess. A strong artery forceps is now introduced into the incision and pushed into the abscess cavity. The forceps are spread apart and you see a large amount of pus escaping. I will now explore the abscess cavity in order to break down any possible septa that might be present. Not infrequently more than one abscess is present, and unless all the abscess cavities are reached we do not accomplish our object, and the patient continues to have chills and fever, and a secondary operation is necessary. After having satisfied myself that but one cavity is present, a rubber tube is placed in the cavity and a small wick of iodoform gauze introduced on each side of the tube. One or two silkworm-gut sutures suffice to close the skin incision around the drainage-tube. Where the operation is carried out in this way it is a very simple procedure, requiring a small amount of dissection and a very short anesthesia.

After-history.—The culture of pus obtained from the finger showed the presence of streptococci. The culture made from the pus obtained from the prostatic abscess showed the presence of streptococci, staphylococci, diplococci, and a diplobacillus.

Complications of the Operation.—Injury to the rectum may occasionally occur in cases in which there is a good deal of periprostatitis and periproctitis. Urinary fistulæ occasionally are complications of prostatic abscess.

CLINIC OF DR. DAVID C. STRAUS

Michael Reese Hospital

PERFORATED GASTRIC ULCER—DIAGNOSIS, SURGICAL MANAGEMENT, TREATMENT BY ACTUAL CAUTERY

Summary: Two cases analyzed from the standpoint of the operative indications. The chief points in diagnosis. Choice of procedures at operation. Type of case in which excision with the cautery is desirable. Technic of cautery excision. Present views on gastro-enterostomy as a part of the operation for acute gastric perforation.

The two patients I wish to present to you this morning were both operated on by me for perforated gastric ulcer, the one the day before and the other the day after Christmas. They are interesting, for although the perforation occurred at the usual site in both cases—on the anterior wall of the pyloric portion of the stomach about midway between the greater and lesser curvature—the clinical and anatomic findings were quite different in the two cases, and they were accordingly treated quite differently. Consideration of these two cases will help to emphasize the importance of not following a routine method of treatment. I wish to discuss the indications for treatment and emphasize the necessity of early diagnosis and of immediate operation.

The *first patient*, L. F., a man of thirty, cabinet-maker by occupation, consulted Dr. M. L. Goodkind at his office on the afternoon of December 22d because of epigastric pain, nausea, and vomiting. The patient's appearance, the marked tenderness in his epigastrium, combined with his typical gastric ulcer history, caused Dr. Goodkind to believe he ought to lose no time in getting to the hospital, although a white blood count made at the office was only 8000. The patient was instructed to enter the Michael Reese Hospital at once, but he did not come to the hospital until the following morning at 10.30 A. M., when he was admitted to the medical service.

His complaints on admission were pain in the abdomen, nausea and vomiting, constipation, and loss of weight. The pain had been present for the past ten years, was severe, occurred about two hours after meals, and was associated with vomiting at the height of the pain, which the patient referred to as "cramps."

On admission the patient was clearly suffering from severe abdominal pain. The physical examination at this time revealed nothing of importance. There was no abdominal tenderness or rigidity.

The temperature, pulse, and respiration on the day of admission were as follows: 10.30 A. M.—98.6° F.; 60; 18. 4 P. M.—99.8° F.; 96; 22. 8 P. M.—98° F.; 96; 24.

A blood count at noon showed 14,200 leukocytes, with 85 per cent. polymorphonuclear leukocytes, 11 per cent. small mononuclear leukocytes, and 4 per cent. large mononuclear leukocytes.

A soapsuds enema was given at 7.30 P. M. This was followed by a constipated stool. Shortly after this he vomited some dark brown fluid. As he was suffering severe pain he was given camphorated tincture of opium, dram 1, at 8 and 9 P. M., and a hot-water bag was applied to the abdomen. After this he seemed to be relieved until 11.30 P. M., when he had such severe cramping pains that he got out of bed and rolled around on the floor. At 10 P. M. his temperature was 100.2° F., pulse 80, and respirations 20. At 12.30 A. M. (12/24/19) his temperature was 100.9° F., pulse 100, and respirations 20, and he was still having a great deal of pain. At 1 A. M. he vomited a small amount of brown fluid. At this time the white count was 22,100.

I was called to see the patient at 2 A. M. Examination at 2.30 A. M. showed that the patient was having severe colicky pains in the abdomen and was writhing with pain. The lips were slightly cyanotic; pupils were equal and reacted to light and accommodation, and the pulse was 92. There was marked rigidity of the entire upper abdomen above the umbilicus. This was board-like and equal on both sides. There was slight rigidity of the lower abdomen, also equal on both sides.

There was no definite point of tenderness over the abdomen. On percussion there was a suggestion of dulness in the left flank. Percussion over the lungs anteriorly was normal. In striking contrast to this there was tympany over the liver area anteriorly as far as the midaxillary line; in other words, obliteration of the liver dulness. This obliteration of the liver dulness, which is regularly described in most text-books as one of the signs to be looked for in cases of perforated viscera, is so rarely observed that the average student gets an entirely erroneous idea of its frequency and value. In my experience this is the first instance in which I have observed it, and it was most striking. A diagnosis of ruptured gastric ulcer was made and the patient prepared for immediate operation. He was given morphin sulphate, grain $\frac{1}{4}$, with atropin sulphate, grain $\frac{1}{150}$ hypodermically. *One should never give morphin in any acute abdominal condition until one has satisfied himself with his diagnosis, and then it should be given to relieve the pain and combat the shock.*

Operation.—Gas-ether anesthesia was used and the operation begun at 3 A. M. A midline incision was made from just below the ensiform to the umbilicus, going at once to the peritoneum, which, when exposed, bulged, due to the presence of free gas and escaped blood and gastric contents. On incising the peritoneum a large amount of escaped gastric contents, chiefly fluid mixed with blood, presented. The stomach was at once exposed and examined and the site of the perforation quickly found on the anterior surface near the pyloric sphincter. The perforation was of about the diameter of a 38-caliber bullet, and was located at the center of a very pale, almost white, sclerosed area about the size of an adult human ear, and this entire area was as hard as cartilage, and showed some apparently very fresh fibrin on the serosa. A large amount of fluid gastric contents, which was stained with fresh blood, was escaping from this large perforation. An assistant was directed to pass a stomach-tube and aspirate as much of the remaining contents as possible. While it is unwise to pass a stomach-tube before the operation has been begun, because of the danger of producing bleeding from the ulcerated area, I believe it is of considerable value to aspirate whatever stomach contents may still be present after the abdomen has been opened and bleeding can be controlled, for not infrequently, as in this case, when the abdomen is open there may be considerable escape of gastric contents. This is probably to be explained by the fact that the perforation may be temporarily or partially closed by loosely adherent omentum or bowel, which, when the abdomen is opened and the pressure conditions changed, or due to manipulation in seeking the perforation, becomes loosened and allows the free escape of the remaining gastric contents, which may be and often is considerable. Next the perforated area was well exposed and the perforation closed, using one row of interrupted through-and-through black waxed silk sutures, placed at right angles to the long axis of the stomach in order to prevent narrowing. This row was reinforced and buried by a row of interrupted Lembert sutures of the same material. This second row extended well beyond the first at both ends. The left hand was now introduced low in the abdomen and a suprapubic stab incision made, through which a large rubber drainage-tube was inserted into the pelvis. Then a blunt glass irrigating point, which was connected to a large percolator by means of a rubber tube, was introduced into the upper incision and the entire peritoneal cavity was irrigated thoroughly with normal saline solution, placing the irrigating point first in one kidney pouch and then in the other, and giving particular attention also to the subdiaphragmatic space. Masses of undigested food particles and mucus in considerable amounts escaped through the suprapubic drainage-tube. The irrigation was continued until the solution returned clear. Perhaps 1½ gallons were used before the irrigation was discontinued. The fluid then remaining in the abdomen having been sponged away, a rubber drainage-tube and a Bullet drain were inserted in the upper wound, which was then closed in layers.

The patient left the table in good condition. He was put in bed and the head of the bed was well raised.

After-history.—The postoperative course was uneventful.

There was no vomiting at any time. The patient received nothing by mouth until the morning of December 25th. After operation he was given three enemas, each consisting of 6 ounces of strong coffee, with $\frac{1}{2}$ ounce of brandy, at four-hour intervals. Following this proctoclysis was given, using 20 per cent. brandy, 3 per cent. glucose, and 2 per cent. sodium bicarbonate in tap-water, allowing this to run by the drop method for periods of two hours, and then discontinuing for two hours, and repeating. This was continued until fluids were given by mouth on the morning of December 25th, when water and tea were begun in 1-ounce doses and repeated every half-hour. Gelatin and broth were begun on December 31st. On January 8th he was put on a soft diet, consisting of cereals, eggs, toast, and custard.

The large rubber drainage-tube was removed on the morning of December 25th. The Bullet drain was removed on the 27th and a small guttapercha drain inserted in its place, and the suprapubic drain was shortened 1 inch. On the 28th it was removed entirely and substituted by a guttapercha drain. On the 29th both guttapercha drains were permanently removed.

No medication was given except a hypodermic of morphin sulphate, grain $\frac{1}{8}$, with atropin sulphate, grain $\frac{1}{200}$, at 1.30 A. M., December 25th, and $\frac{1}{8}$ grain of morphin at 12.30 A. M., December 26th. He was discharged on January 19th.

The *second patient*, W. J., a white male, aged thirty-three, married, was brought into the hospital at 5 P. M., December 26th, in a police ambulance. He was suffering with severe abdominal cramps. which he said began suddenly about 3 o'clock in the afternoon while he was driving his wagon. The pain became rapidly worse, but he was able to get down from his wagon and go into a store, where he was found by the police.

He stated that he had been perfectly well so far as he knew and that this attack of pain came on without warning. Further questioning, however, revealed that he had had indigestion since October, 1918, with pain coming on about two hours after meals, associated with sour eructations and the belching of gas, but that he had not paid much attention to these symptoms. He never went to a physician for this indigestion, but he found that the pain and discomfort were relieved by taking food or sodium bicarbonate. He never vomited or noticed any dark stools. The pain was most severe about 2 P. M. It never awakened him at night and was never severe enough to cause him to go to bed. He had been absolutely free from any pain or discomfort for the last month or so. He gave no history of having had pain in the right iliac fossa at any time. His bowels had always been fairly regular and urinations normal. He ate and slept well.

About one and a half months ago he had influenza, and at this time coughed a great deal. He has coughed more or less ever since. He had no cough previous to the attack of influenza, not did he have any abdominal trouble during the attack. His past history was negative except for the indigestion, which began in October, 1918. He gave a history of Neisserian infection, but denied ever having had a chancre. When a young man he drank heavily of alcohol, but had abstained completely for the last three years.

I saw the patient at 5.15 P. M. The following are the more important facts of the physical findings dictated by me at that time:

"The patient appears to be in great pain. His lips and nails are cyanotic and extremities are cold. He appears to be in a moderate degree of shock.

"Head and neck are negative. Pupils are equal and react normally to light and accommodation. The lungs show the presence of a few crepitant râles over the left lower lobe posteriorly; the lung findings otherwise are normal. The heart is normal; pulse is regular, weak, and the rate is 64.

"Examination of the abdomen shows no obliteration of the liver dulness. The upper border of the liver is at the sixth rib in the nipple line, at the eighth rib in the axillary line, and at the tenth rib in the scapular line. The abdomen is scaphoid. There is marked rigidity, particularly in the upper half, and this is equal on both sides. The recti muscles stand out prominently. There is considerable rigidity over the lower abdomen, with tenderness on both right and left sides, but slightly more marked on the right side. There is a definite point of maximum tenderness about two fingerbreadths directly above the umbilicus. Palpation of the liver is difficult because of the rigidity, but percussion shows the lower border of liver dulness to be two fingerbreadths below the right costal margin. There is apparently some shifting dulness in the right flank which changes with the position of the patient, but it is difficult to be certain of this because of the marked rigidity of the abdominal wall." A diagnosis of perforated gastric ulcer was made and immediate operation arranged for.

At 5.45 P. M. his temperature was 97.6° F., pulse 76, and respiration 16.

As soon as the diagnosis was made the patient was given a hypodermic injection of morphin sulphate, grain $\frac{1}{4}$, with atropin sulphate, grain $\frac{1}{150}$.

Blood count made at 6.40 P. M. showed 26,000 leukocytes. Urine examination was normal.

Operation.—Gas-ether anesthesia was begun at 6.45 P. M. A midline incision was made from just below the ensiform to the umbilicus. On opening the peritoneum no fluid was encountered. The stomach was at once exposed and an area of fibrin indicated the region of the perforation on the anterior surface near the pylorus. Before inspecting this area the gall-bladder, which was easily exposed by retracting the wound edges, was examined and was found to be distended but normal. The transverse colon and omentum were then drawn out through the incision and the area about the pylorus was carefully and thoroughly packed off from the general peritoneal cavity, using three hot wet sponges. The perforation was now examined and found to be a pin-point perforation (Fig. 174, 1) located about midway between the greater and lesser curvature on the anterior surface of the pyloric portion of the stomach, about 2 inches from the pyloric sphincter. A very small amount of fluid gastric contents was slowly escaping and a very little was free in the abdomen. This was carefully sponged away and an assistant was directed to pump out the stomach by means of a stomach-tube and aspirator. The stomach being emptied (fresh red blood came away with the gastric contents), the perforated area was examined.

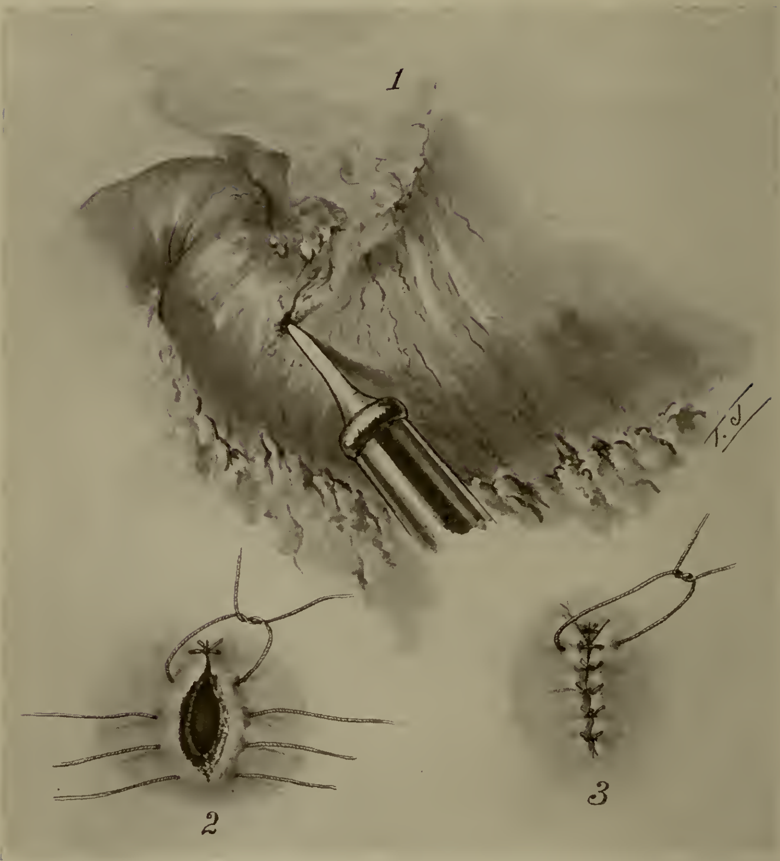

Fig. 174.—1, Method of cautery excision of a perforated gastric ulcer at the usual site of perforation; the cautery is passed through the perforation and the ulcer burned away peripherally. 2, First row of sutures inserted to close the opening. This is a row of through-and-through interrupted stitches of black waxed silk, the stitches passing through all layers of the stomach wall. These stitches are placed transversely to the long axis of the stomach so as to prevent narrowing. This is perhaps the best method of closure in large perforations whether cautery excision is practised or not, as in Case I, where the perforation was so large and the sclerosis around it so marked that it would not lend itself well to a simple purse-string closure. C, Second row of sutures inserted to bury the first row and reinforce it. This row, like the first, is placed at right angles to the long axis of the stomach to prevent narrowing. Care must be taken to extend this row well beyond the first row at each end, so as to ensure a water-tight closure.

There was a wide area of induration, perhaps an inch wide, all about the perforation, easily palpable through the stomach wall by the hand introduced behind the stomach. The ulcer was excised with an electric cautery, introducing the cautery point through the perforation and thoroughly cauterizing its edges (Fig. 174, 1). The larger opening thus produced was closed by means of four interrupted through-and-through sutures of black waxed silk (Fig. 174, 2), placed at right angles to the long axis of the stomach to prevent narrowing and buried and reinforced by a layer of Lembert sutures (Fig. 174, 3), as in the previous case. The closure was further strengthened by sewing a pedunculated flap of omentum over the line of sutures. A cigarette drain was introduced down to the site of the perforation and the abdomen then closed in layers. The drain was allowed to come out at the lower angle of the wound.

The patient left the table in excellent condition.

After-history.—When the patient was returned to bed his pulse was 84 and of good quality. The details of the after-treatment were similar to that employed in the first case. Fluids, except milk, were begun by mouth on the morning of the 28th, and continued until January 1st, when broth and gelatin were added to the diet. On the 4th soup and custard were added, and light soft diet was begun on the 7th.

On December 27th, the day following operation, the temperature ranged from 99° to 100.4° F., the pulse from 72 to 88, and his condition seemed excellent, except that in the evening he was bothered by some mucus in the larger bronchi. On the 28th he was somewhat cyanotic and complained of considerable mucus which he could not raise. The temperature on this day rose to 101° F. by evening, though his pulse remained between 76 and 82, and respirations 20 to 24. On the morning of the 29th the patient was still cyanotic and still troubled with mucus. The drain was removed permanently. The abdomen was soft and not tender. His temperature, which was 100° F. in the morning, rose to 102.6° F. at 4 P. M. At 8 P. M. it was 103° F., and by midnight reached 104.4° F. His pulse-rate varied between 92 and 108. Respirations, which had remained at 20 during the day, rose to 32 by midnight. On December 30th examination showed the abdomen everywhere soft and no area of tenderness. There was some slight distention, but no dulness in the flanks. The upper border of liver dulness was normal. The patient was still very cyanotic, troubled with considerable mucus, and there was roughened breathing over the right side of the chest, especially posteriorly and laterally over the lower right lobe. His condition suggested more a central pneumonia than an abdominal case. The temperature varied between 102° and 104° F., pulse between 100 and 124, and respirations between 24 and 28.

When seen the next morning, December 31st, his condition seemed about the same and the findings were practically the same as on the previous day. By 4 P. M. his temperature had risen to 105° F. At this time his pulse was 100 and respirations 24. I deemed it advisable to examine the patient radiologically in order to rule out the possibility of a subphrenic abscess. He was therefore taken to the *x*-ray room at 4.30 P. M. and fluoroscoped on the table. Cloudiness was seen in the middle of the right lower lobe. The diaphragm on the right side moved very little, but this is what one would expect from the amount of pathology in the right lower lobe. There was no fluid in either pleural cavity. A roentgenogram (Fig. 175) was taken which showed patches of cloudiness in the right lung extending from the second rib to the diaphragm. It was impossible to tell from the plate whether or not there was any subphrenic involvement. A diagnosis of bronchopneumonia was made. The relatively low pulse and respiration as compared to the fever suggested a subphrenic abscess, although the extreme height of the temperature made me believe that the patient was suffering from pneumonia, as I recorded the day before. Blood count showed 24,400 leukocytes.

The next day, January 1st, he began expectorating a large amount of mucopurulent sputum. His general condition seemed a little better and his temperature came down to 100° F. and even to 99° F. during the course of the day. His pulse came down and remained between 72 and 88, and the respirations dropped from

24 to 20. From this date he made a progressive recovery. All stitches were removed on January 5th. He was up in a wheel chair on January 11th, walking around on the 14th, and was discharged on the 20th.

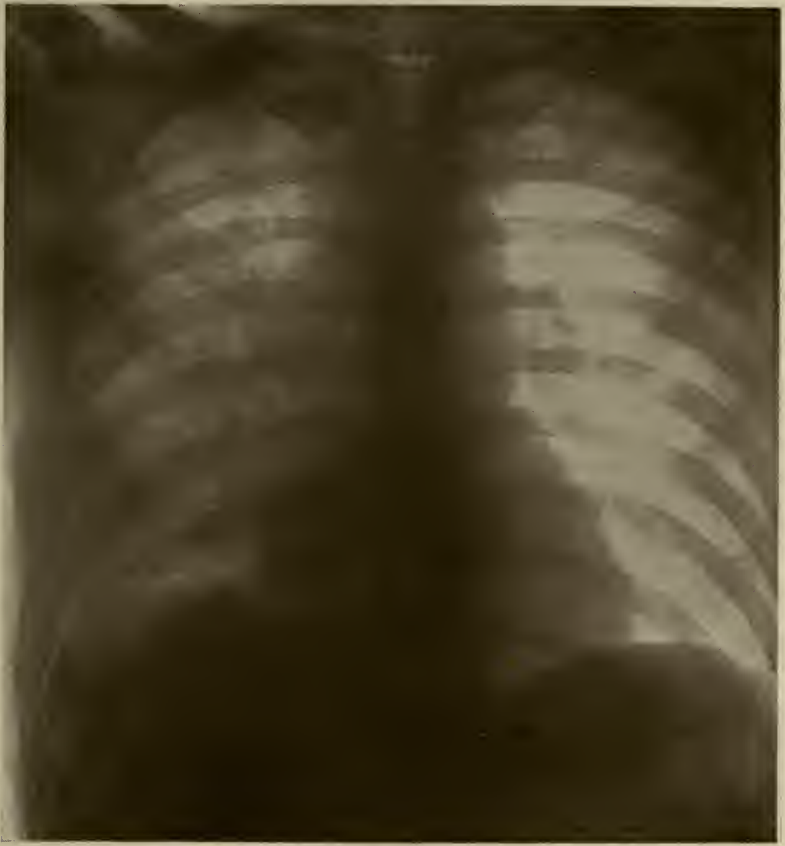

Fig. 175.—Roentgenogram of Case II taken December 31, 1919, five days after the operation. This reveals patches of cloudiness in the right lung extending from the second rib down to the diaphragm. There is no fluid in either pleural cavity. The diaphragm appears normal on both sides. There is evidence of subphrenic abscess. The findings corroborate the clinical diagnosis, made previously, of postoperative bronchial pneumonia. Note the enlargement of the right heart to the right (compare with Fig. 176).

Roentgenologic examination made the day before he left the hospital to determine the condition of the right lung is a matter of interest. The roentgenogram (Fig. 176) shows the lung to be entirely clear, except that the bronchial tree is much more

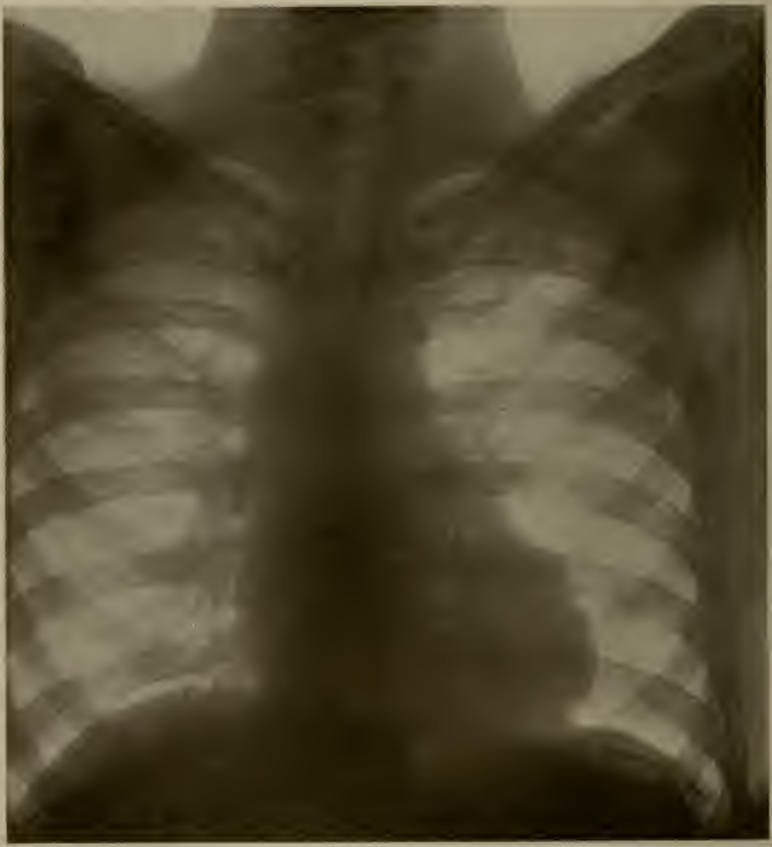

Fig. 176.—Roentgenogram of Case II taken January 19th, the day before the patient was discharged from the hospital. This shows that the bronchial pneumonia has entirely disappeared; the right lung is entirely cleared except for some increase over normal of the bronchial shadows. This is probably in a large part due to peribronchial thickening, the result of the recent pneumonia. The bronchial tree in the left lung is also more marked than normal. These increased bronchial shadows probably are the result of the lung condition from which the patient suffered during his attack of influenza, six weeks before his entrance into the hospital.

pronounced than normal, probably the result of slight peribronchial infiltration, the only remains of the recent bronchial pneumonia. Comparison of this plate with the one taken while the bronchopneumonia was present shows an interesting difference in the heart findings at these two times. You will note that the right border of the right heart is considerably further to the right when the pneumonia was present than after the pneumonia had subsided. This is, of course, what one so often sees during the course of pneumonia—enlargement of the right heart due to the increased work thrown upon it. The marked difference of the right heart seen in the two plates may be in part due to a difference in the point of focus and focal distance when the two exposures were made.

These two cases, both seen comparatively early and both perforated at the usual site—on the anterior surface near the pylorus—presented quite different findings both as regards the size of the perforation and the amount of escaped gastric contents. They were, therefore, treated quite differently, and with recovery in both cases. It may be of interest to consider the management of these cases, and in particular to consider the merits of the various methods of treatment, for there is a considerable difference of opinion among surgeons as to the value and even propriety of certain procedures that are in general use today. But before entering upon a discussion of treatment let us briefly review some points in the diagnosis.

DIAGNOSIS

The *diagnosis,* in cases seen early, is usually easy. The patient appears very ill, is often in a moderate degree of shock, is suffering with agonizing epigastric pain, which as a rule begins suddenly as a sharp stabbing pain, often associated with or followed by vomiting. The initial vomiting may or may not be repeated. The vomitus often contains blood. Where this is present, it is of considerable diagnostic aid. Careful questioning will often elicit the typical history of a gastric ulcer, as was given by the first of these two patients. Frequently there may be merely a history of previous indigestion, as in the second case.

Less often, but by no means rarely, there may be no history of any antecedent gastric disturbance, and the perforation may have come on without warning as the first symptom of an absolutely latent gastric ulcer. Or again, as in the second of these two cases, although the patient may have been troubled with indigestion over long periods in the past, there may have been an entire absence of indigestion for a long time immediately before the perforation occurred, and the perforation strikes the patient down when he feels and believes he is perfectly well. This brings up the question of premonitory symptoms. Are there any symptoms or signs that warn of a threatening perforation? There are no symptoms that are characteristic of a threatening perforation, though there are several which, if present, are suggestive. The indigestion is frequently worse just before perforation occurs, and there is often an increase in the epigastric pain and tenderness. However, many cases, as the one just referred to, give no prodromal symptoms whatever. The other case, the one that was seen by Dr. Goodkind the day before perforation occurred, impressed him as being in such serious condition that he advised the patient to go to the hospital at once, and this was thirty-six hours before the perforation occurred. It is most instructive and interesting that a blood count taken at that time showed a leukocyte count of only 8000.

Examination of a patient seen soon after the perforation has occurred shows such a board-like rigidity of the abdomen as is seen in few other conditions. The rigidity is more marked in the upper than in the lower abdomen, and is about equal on both sides. The entire abdomen above the umbilicus is as near board-like as it is possible for muscle rigidity to be. In cases seen early this is typical. Mayo has pointed out, however, that it is not always present, as some few people have an insensitive parietal peritoneum, and in these rigidity may be absent. But such is decidedly the exception, and only goes to prove the rule. If one sees the patient at this early time, soon after the perforation has occurred, he will not need to call upon a colleague to corroborate the finding of rigidity. No layman could miss it. Usually in from two to three hours after the perforation has occurred there is a period during which all the symptoms abate. The rigidity is now very much less marked, and the patient looks and feels better, the pain is less severe, though it has not entirely disappeared. If the physician sees the patient for the first time during this stage, he may easily overlook the serious nature of the case, and unless he has obtained an accurate history, could easily fail to make a proper diagnosis. A careful history is the most important means of making the correct diagnosis in a case seen at this stage. The rigidity may be so much less than it was earlier that the physician may want a colleague to corroborate his finding of rigidity. But it is usually there. Up to this time there is usually a point of maximum tenderness, and this, as a rule, corresponds closely to the area of maximum pain. This is usually in the epigastrium, either directly above the umbilicus or a little to the left of the midline. The temperature and pulse at this time are usually about normal. If there is much shock, the temperature may be slightly subnormal. The pulse may be slightly increased in rate, but this is minimal as a rule. The leukocyte count, however, is definitely increased and is somewhere about 12,000 to 14,000. As time passes, the pulse-rate and leukocyte count progressively increase. The first case was very instructive in this regard. The leukocyte count the day before perforation was 8000. The evening that perforation occurred it rose to 14,000, and just before operation, about six hours after perforation occurred, it had risen to 22,000. It does not always reach this height.

In cases seen after a longer time has elapsed the picture changes. The patient seems to become sicker again. Peritonitis has commenced. Cases seen at this time are most frequently mistaken for cases of appendicitis. This is due to the fact that the escaped gastric contents gravitate toward the right iliac fossa, guided there by the attachment of the mesentery or by the ascending colon. The pain and tenderness as well as the rigidity are now most marked over the region of the appendix. Every surgeon of any considerable experience has seen cases operated upon under this mistaken diagnosis. Fortunately, I have never made this unpleasant mistake. But where a case has been brought to the hospital late, and the well-meaning but unwise physician who saw the case early has given the patient a dose of morphin to relieve the patient's suffering without making a proper diagnosis, a surgeon can be excused for opening the abdomen under this erroneous diagnosis. And even where the case has been seen by the surgeon from the onset, it is not always possible to be sure of his diagnosis, and in such a case he performs a purely exploratory laparotomy, believing that he is dealing with a surgical abdomen. It is not always possible to tell whether he is dealing with a ruptured gall-bladder, an acute pancreatitis, etc., but it is better judgment to make an early small exploratory incision to determine the diagnosis than to wait to make a more positive diagnosis, and in the meantime have the patient lose his best chance of recovery. In this connection it is of interest to point out that one may find rare cases of influenza in which there is just as sudden, severe abdominal pain and just as marked epigastric rigidity as one finds in a case of perforated gastric ulcer, and I have recently seen such a case. The one diagnostic differential point, however, is that in influenza instead of a definite leukocytosis one ordinarily finds a leukopenia.

Cases of perforated gastric ulcer that are seen late, say after the first twelve hours, present the usual picture of general peritonitis, and at this time, except for a good history, it is often impossible to make an accurate diagnosis of the cause of the peritonitis.

It is clear, therefore, that no matter at what stage the patient is seen, the history is a most valuable if not *the* most valuable element in arriving at a correct diagnosis, but as the patient's chances of recovery are in inverse ratio to the time that has elapsed, it is most important to operate early.

SURGICAL MANAGEMENT

The aim of the surgical management should be to perform a simple, rapid operation to close the perforation and free the peritoneal cavity of the escaped gastric contents with the minimum operative risk. Where the continuance of a local pathologic condition can be dealt with or future complications prevented by a minor additional procedure, this may be added; but no complicated procedure should be considered which prolongs the time of the operation.

Anesthetic.—A general ether anesthesia should be employed as a rule. When, however, a case is seen late, the operation is at times well conducted under local anesthesia, with perhaps the addition, when needed, of gas-oxygen general anesthesia.

Incision.—As the great majority of perforated gastric and duodenal ulcers lie close to one or the other side of the pyloric vein, and as the other conditions from which a perforated gastric ulcer has to be differentiated can also be reached through a suitable incision, which is often in the nature of an exploratory one, I prefer to open the abdomen by a midline incision beginning above, just below the xiphoid cartilage, and continuing downward to the umbilicus, or curving slightly to the left of this, and continuing to a little below this level. It is desirable to have ample exposure, so that the perforation can be easily dealt with and the operation can be rapidly completed.

The perforation is usually easily found by the presence about it of fresh fibrin, and stomach contents can often be seen escaping through the opening. At times it is difficult to locate the perforation. In such a case pressure on the stomach usually causes some air or fluid to escape, and this aids in locating the perforation. To aid in locating the perforation Baker[1] has suggested that in cases in which an acute perforating gastric or duodenal ulcer is suspected, the patient be given by mouth 3 grains of methylene-blue dissolved in an ounce of water. On opening the abdomen the site of perforation is plainly made out by the blue color of the serosa. The method has proved of definite value and can be recommended. After a perforation has been found, one must not neglect to search for a second one, which occasionally is present.

Closure of the Perforation.—It has of late been taught that a perforated gastric ulcer is a cured ulcer. For this reason it has become the accepted practice merely to close the perforation.

---

[1] Surg., Gyn., and Obst., 1917, 25, 695; 1920, 30, 93, 94.

This is most often done by means of two superimposed purse-string sutures—the first closing the opening and the second burying and reinforcing the first suture. Excision of the edges of the perforated area has in general been given up of late, the belief being that excision is both unnecessary and undesirable. The recent statistics of Gibson[1] would seem strong substantiation of this belief.

Excision of the margins of the perforation has been suggested for two reasons: first, to assure cure of the ulcer, and, second, to free the stomach of any latent carcinoma that may be present in the margins of the ulcer crater.

As far as cure of the ulcer is concerned, it seems rather well established that perforation usually does result in cure. When the perforation is large, and the entire floor of the ulcer has cut itself away in an old sclerosed ulcer, this would seem more logical and easier to understand than in case of a pin-point perforation in a rather recent ulcer. In the latter case it is more difficult to feel convinced that this minute perforation will result in cure, especially where the minute perforation is surrounded by a wide zone of induration, as was found in the second case.

While I do not believe it would be necessary to resort to cautery excision in the former type of case in order to insure cure of the ulcer, and this was not resorted to in the first case for this reason, I do believe that cautery excision may be desirable in treating these pin-point perforations surrounded by a rather extensive area of induration.

The cauterization not only accomplishes sterilization of the infected area (if one agrees with Rosenow's theory) but also carries with it a rapid, simple, and effective means of destroying and guarding against the development of carcinoma, as has been taught and practised by Balfour in the treatment of simple gastric ulcers, chronic perforated gastric ulcers, and those threatening to perforate, where perforation has progressed to just below the serosa.

The great frequency with which carcinoma is being found microscopically in cases which clinically and macroscopically are diagnosed as simple callous ulcers demands consideration. This has been pointed out and emphasized for years by the Mayo clinic.

---

[1] Surg., Gyn., and Obst., vol. xxii, April, 1916, p. 388.

Wilsensky and Thalheimer,[1] in an investigation to determine the etiologic relationship of benign ulcers to carcinoma of the stomach, failed to find absolute proof that carcinoma of the stomach can arise in a pre-existing ulcer. From their own study and from the results reported by others they believe it is fair to presume that in a very small percentage (1 to 2 per cent.) carcinoma has arisen in an ulcer; that the majority of ulcerated gastric lesions are either simple chronic ulcers or definite carcinomas from the onset. The most important fact they pointed out, however, is that *of the 48 ulcerated gastric lesions they studied, all of which appeared benign grossly, 18.7 per cent. were proved by the microscope to be malignant.* Küttner[2] found the same in 43 per cent. of his series; and Payr[3] has found it in about 26 per cent. Demmer,[4] taking into consideration these high percentages of carcinoma in apparently simple ulcers, concludes that the area of perforation should be excised as a routine. While one would hesitate to urge the routine excision as desirable to insure cure of the ulcer, especially in view of Gibson's statistics, nevertheless the constantly increasing statistics showing the frequency with which carcinoma is being found in what are clinically apparently simple callous ulcers is a strong argument in favor of routine excision, and, in particular, for cautery excision. However, except in the hands of skilled surgeons I believe it would be dangerous to advocate the general use of cautery excision in the treatment of acutely perforated gastric ulcers, and statistics alone will determine the wisdom of resorting to cautery excision as the routine treatment of these cases, even in the hands of skilled surgeons.[5]

Demmer advocates that in addition to routine excision of the ulcer, gastro-enterostomy should in every case be added, with,

[1] Annals Surg., vol. 67, 1918, p. 215.

[2] Arch. f. klin. Chir., Bd. 93. [3] Ibid., Bd. 93.

[4] Beiträge zur klin. Chirurgie, 1918, Bd. cxi, 2, 400–438.

[5] Since this clinic was held and reported for publication Kirkland (The Lancet, vol. 198, No. 1, p. 26) has reported 3 cases successfully treated by this method, and he is a strong advocate of this method.

the idea of not only temporarily relieving the suture line where the ulcer closure has been made but also of insuring permanent cure of the underlying causal pathology.

The question as to whether or not a gastro-enterostomy should be performed as more or less of a routine in cases of perforated gastric ulcer is under active discussion, and there is still a marked difference of opinion. The routine performance of a gastro-enterostomy was strongly advocated by Deaver[1] in this country several years ago, but it has not found general favor. Richter,[2] of this city, however, has recently argued in favor of the routine performance of gastro-enterostomy in these cases. Gibson admits "it may rarely be indicated to forestall stenosis." He rejects it as a curative in this class of cases, for he believes it is "unwise to do a gastro-enterostomy for a condition which is going to be cured anyhow." In the very small percentage of cases in which a gastro-enterostomy may possibly later become necessary he wisely postpones that operation until its indications are clearly recognizable. His mortality statistics and results would seem to bear out his argument.

Eliot[3] is of essentially the same belief. Bevan[4] believes there is "no logical reason in the world for combining gastro-enterostomy in the operative treatment of these perforations unless there is definite evidence of pyloric obstruction," and points out the greatly added risk of performing a gastro-enterostomy under these most unfavorable conditions.

Contrary to this consensus of opinion among the more prominent American surgeons against the routine use of gastro-enterostomy in the treatment of these cases, it is interesting to learn from the most recent German journals that many German surgeons are coming to use gastro-enterostomy as a routine in these cases. Demmer not only comes out strongly for it himself, but states that in the University Clinic at Frankfort, of which Dr. L. Rehn is director, in addition to the local care of the perforation gastro-enterostomy has seemed to become more and more necessary and is now done wherever possible. Rosenthal,[1] in a very recent article, similarly comes out strongly in favor of gastro-enterostomy in the treatment of perforated gastric ulcer, and states that it should be added whenever possible. His article is also of interest in that he points out the very striking recent increase in frequency of perforated gastric ulcer in Germany. In the city hospital of Darmstadt, in which he is on service, there is an average of 5000 new admissions yearly. In this hospital, during the ten years previous to 1918, there were only 14 cases of acute perforated gastric ulcer. In striking contrast to this, there were 10 cases in the six months ending at the time Rosenthal made his report in 1918. He attributes this striking increase in frequency largely to the carbohydrate diet and the stress and strain due to the war. Noetzel[2] similarly advocates gastro-enterostomy as a routine in perforated gastric ulcer in all cases except when the vital condition of the patient demands that the operation be rapidly completed.

---

[1] Trans. Phila. Acad. Surg., 1914.

[2] Surg., Gyn., and Obst., vol. xxviii, April, 1919, p. 399.

[3] Amer. Jour. Surg., October, 1908.

[4] Surg., Gyn., and Obst., vol. xxii, April, 1916, p. 499.

At present I believe that, in view of our American statistics, the following conditions, if present, might justify the performance of a gastro-enterostomy:

(*a*) One might consider performing it in cases in which there is definite evidence of pyloric obstruction. However, there is no doubt that many of these patients can be tided along on liquid diet until after they have recovered from the dangers of their perforation; and I feel that an operation to relieve this had better be postponed, as a rule, even though it might be necessary to perform the second operation within a few weeks.

(*b*) Cases in which the ulcer is located very close to the pylorus and is of such large size that any operative closure would result in pyloric obstruction, I believe would justify a gastro-enterostomy, and I can imagine that this might be the method of choice, though I have not seen such a case.

(*c*) In case of very large perforations, which cannot be closed by any suture method, and which in the past have been treated by sewing omentum over the large opening; covering it by means of a fascial transplant; or closing it by tamponade; or treating it by inserting a large rubber drainage-tube through the opening (Hochenegg), I believe might in some cases be well handled by means of gastro-enterostomy, thus by the same operation establishing a gastro-enterostomy and effecting a closure of the perforation. Personally, I have never seen so large a perforation, but if I should ever be so unfortunate as to encounter one, I believe I might deal with it in this manner.

---

[1] Beiträge zur klin. Chirurgie, 1918, Bd. cx, Hft. 3, s. 558.
[2] Ibid., s. 580.

Treatment of Escaped Gastric Contents.—When the amount of escaped gastric contents is small or even moderate in amount, but is well limited, it is probably best treated by gently sponging it away. If, however, the amount is large and contains gross food particles, I believe irrigation is indicated, for it is impossible to sponge away gross food particles, and these should not be left in the peritoneal cavity. Irrigation alone can be relied upon to free the peritoneal cavity of such gross soiling, but it must be clearly appreciated that the irrigation cannot effect sterilization of the peritoneum that has been so soiled. However, it so dilutes and spreads the infected material, the organisms of which are reduced in virulence due to the acid reaction of the stomach contents, that the extensive surface of peritoneum with its well-known powers to combat infection, can readily dispose of the mildly infectious material so thoroughly diluted.

The **technic of irrigation** is as I have described it in connection with the first case. If it is deemed essential to irrigate, the perforation should be closed and then a counteropening made, a stab incision above the symphysis, and through this a large rubber drainage-tube is introduced, well down into the pelvis. Then irrigation should be carried out through the upper incision, allowing hot normal salt solution at a temperature of 108° to 110° F. to flow in above and escape below through the suprapubic drainage-tube. It is essential to use a large amount of salt solution—even gallons. The irrigation should be continued until no more food particles escape and the fluid returns clear.

Drainage.—Although the tendency in abdominal surgery today is to drain less than in the past, and some surgeons, as

Gibson, have done away with drainage in these cases, I personally prefer to leave in a small guttapercha drain in cases in which there has been a limited amount of extravasation. I remove the drain at the end of thirty-six to forty-eight hours if there then seems no indication to leave it in longer. When, however, there has been gross extravasation, so that it has seemed wise to irri-

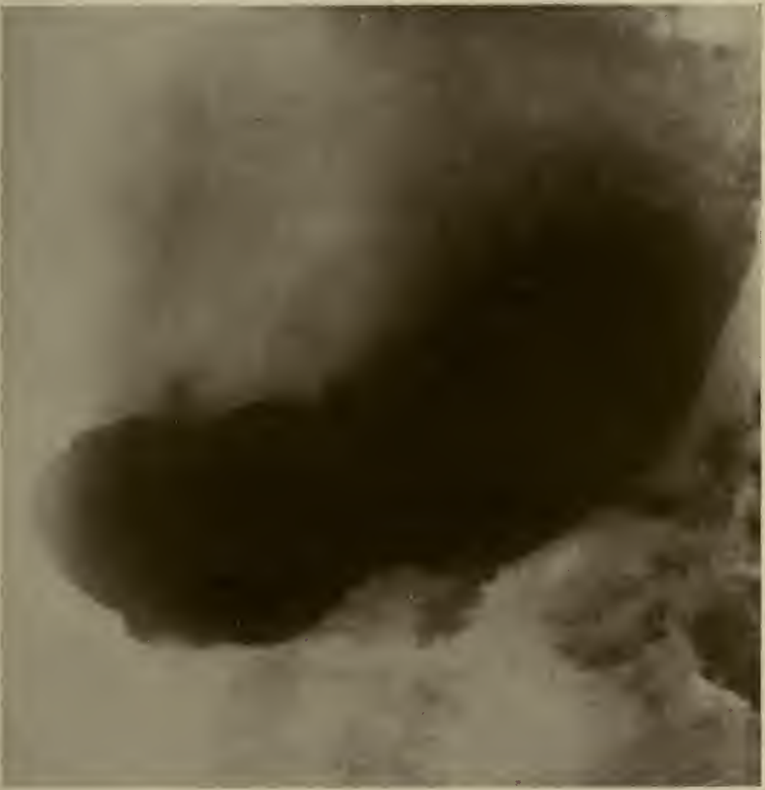

Fig. 177.—Roentgenogram of stomach in Case I filled with an opaque barium meal. This shows that the stomach is orthotonic and normal in location. Two peristaltic waves are seen, which on fluoroscopic examination were seen to travel from the cardia down to the pylorus. The antrum cuts off well and is rounded in outline. The bulbus does not show well, although the duodenum permits of rapid emptying of the stomach, which was complete before the end of five hours. There is no narrowing as a result of the closure of the perforation.

gate, I prefer to leave a drain both in the upper wound and in the suprapubic stab incision, as I did in the first case.

I do not wish to go into the subject of after-care.

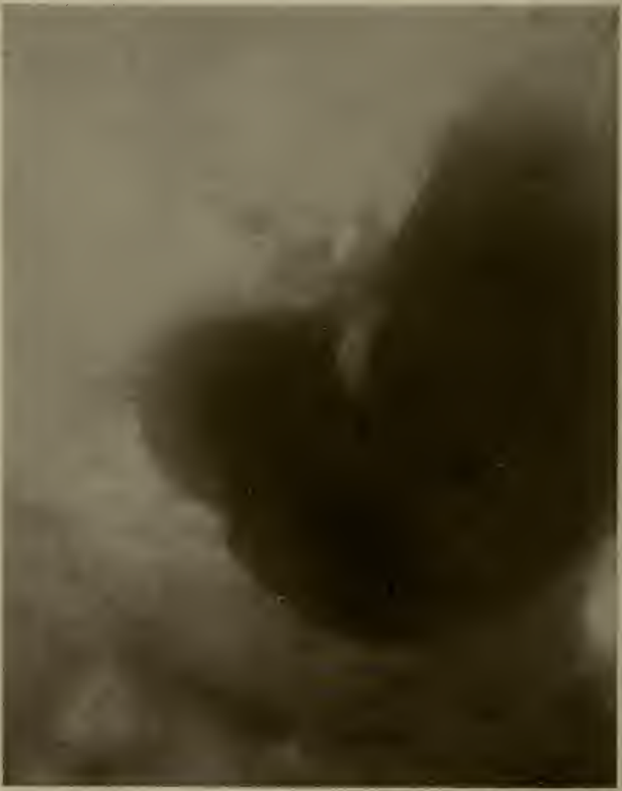

Fig. 178.—Roentgenogram of stomach in Case II filled with an opaque barium meal, taken February 18, 1920. The stomach appears as a normal orthotonic type, coming down just below the crest. No gastric pathology is noted. The peristalsis is good and the antrum cuts off well. There is no evidence at this time of the perforated gastric ulcer and no narrowing as a result of the operation. The stomach was completely emptied before the end of five hours.

In closing, I believe it may be of interest to say a few words in regard to the gastric condition in these two patients at the time they were last examined, February 18, 1920.

Both patients showed stomachs of normal contour and with an emptying time of less than five hours (Figs. 177, 178). When seen five hours after having had the first of a double barium meal, the stomach was entirely empty in each case. Furthermore, neither patient has had the slightest pain since the time of the operation. It may be recalled that the first patient had had severe pains daily for the previous ten years. Neither patient has vomited since he returned from the operating room. Both patients have recently been given an Ewald test-meal, and the gastric contents examined at the end of forty-five minutes. The first patient showed 90 c.c. of coffee-colored fluid (cautery excision was not done in this patient); free HCl, 50; total acidity, 89. The second patient showed 50 c.c. of clear fluid, containing undigested food particles; free HCl, 47; total acidity, 67. Since both patients show higher acid values than normal, they are at present being kept on a mildly restricted gastric ulcer diet.

In conclusion, without wishing to go into the subject of postoperative treatment, I may add that I believe it is important, as part of the after-care, to give these patients the benefit of ulcer management.

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

REPAIR OF THE COMMON BILE-DUCT

Summary: Cholemia resulting from operative injury of the common duct—technic of operative treatment. Method of locating upper and lower ends of duct at point of stricture. The T-tube and the results expected from its use in the ideal case—frequent disappointments. Importance of preventing injury to common duct emphasized by the difficulty of subsequent repair of such injuries, cholecystectomy—with the operator on the left side of the patient—a point in technic.

THE patient I shall operate upon this morning is one of a half-dozen similar cases that we have had to deal with in the last year. The patient is a woman of fifty-two who was operated upon seven or eight months ago for gall-stone disease. The operating surgeon removed the gall-bladder, which was indurated and contracted and contained a number of large stones. The description which I have obtained of the operation is that there were a good many adhesions and that the operation was difficult. The man who operated is a man of large experience and one of our oldest and best known surgeons. The patient made a fairly good recovery from the operation, but she drained bile for a good many weeks afterward through a small fistula at the site of the drainage-tube. This, however, eventually closed. While she was draining bile she was quite comfortable and her general condition was good. After the fistula closed, however, she had one quite severe attack resembling her old gall-stone colic attacks, and this was followed by jaundice and by intense itching. Since that time she has had intermittent jaundice and part of the time the stools have been clay colored and part of the time they have contained bile. The itching has been a very persistent and most distressing symptom.

I have had the patient under observation for several days. The clinical diagnosis which I have arrived at is injury of the common duct from the cholecystectomy operation with resulting scar and stricture, which prevents, for a part of the time at least, the bile from passing into the intestine. The stricture evidently, however, is not complete, because the symptoms are intermittent. It may be that we shall find a stone in the common duct, although from the history of the condition it does not seem as probable to me as the existence of a stricture. The coagulation time of the patient's blood is about four and one-half minutes. She is weak. She has lost a great deal of weight and she is exceedingly anxious to have the operation and be relieved of her trouble, especially of the intense itching.

The patient is now prepared and completely etherized. I am making a large S-shaped incision, dissecting out the scar of the original operation. I fully expect to find this operation difficult, as all these operations are apt to be on account of the extensive adhesions. Opening into the peritoneal cavity I find everything adherent. It is necessary for me to separate the omentum from the liver. Finally, I fight my way down through adhesions so that I can expose the stomach, pylorus, and first part of the duodenum. I find the duodenum is plastered firmly to the liver, and this is dissected off with a great deal of difficulty, and I open into an old pocket of granulation tissue, containing no pus, however, at the site of an old abscess between the duodenum and the liver. With a great deal of care I am able to separate the duodenum from the liver without opening into the gut. I now come down to the foramen of Winslow. I can introduce my finger into the foramen of Winslow and bring up into view the right free edge of the gastrohepatic omentum, which contains the common duct. In order to get a better exposure, so that I can work to better advantage, I shall move to the left side of the patient. This is a point which I have emphasized repeatedly in this clinic in these difficult bile-tract operations. The right free edge of the gastrohepatic omentum as I lift it out is a mass of scar tissue. I cannot recognize the common duct. I can feel the hepatic artery beating distinctly at the upper part of these structures and a little to the left. I cannot make out either by sight or palpation the position of the portal vein. Freeing the free edge as well as I can I now take a hypodermic needle and syringe and attempt to introduce the needle into the proximal end of the common duct (Fig. 179). I do this because I have so frequently found that the proximal

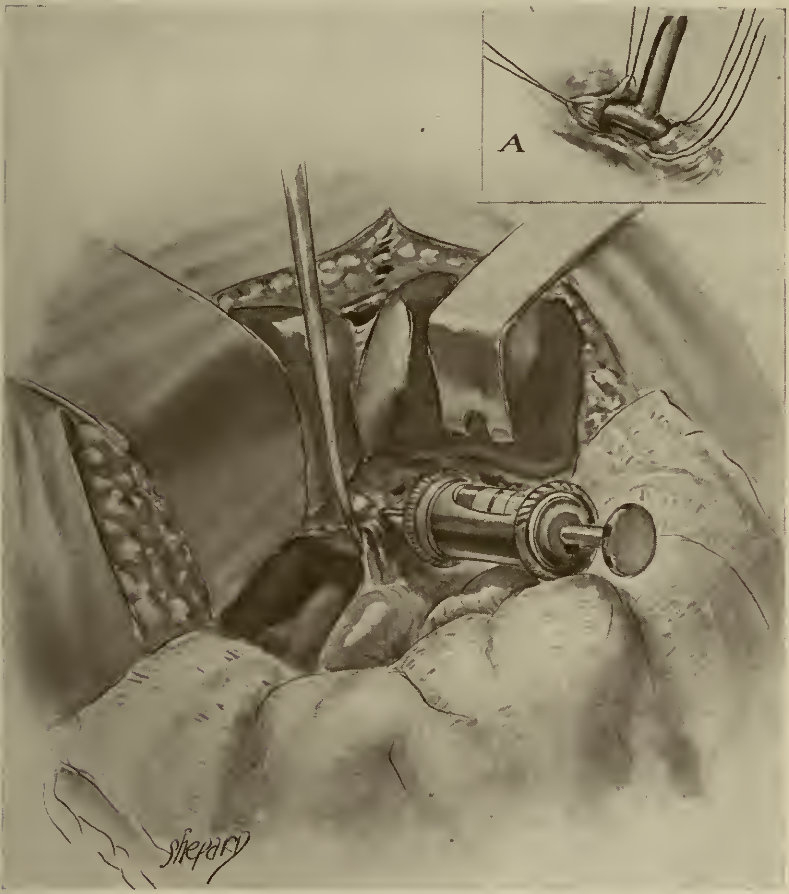

Fig. 179.—Locating ends of common duct by means of aspirating syringe. *A*, T-tube in place; ends of ducts to be approximated as nearly as possible by catgut sutures.

end is dilated with bile and mucus and I have frequently been able to find it in this way with a hypodermic syringe. Plunging the needle into the position where I believe the proximal end of the common duct to be and withdrawing the piston, the syringe fills up at once with mucus containing some bile and what looks like small masses of pus and cholesterin. My needle, therefore, is in the dilated proximal end of the duct. Cutting with a knife along the needle I now open into the duct, and out pours a very large amount of bile-stained mucus. Most of this material is mucus secreted from the intrahepatic bile-ducts. The obstruction has been so complete and for such a great length of time that the secretion of bile has been almost suppressed. I have found this condition in a number of these cases. After opening up the proximal end of the duct I introduce a No. 15 American size rubber catheter into it and allow the mucus to drain out through the catheter.

My next problem is to find the distal end of the common duct and, apparently, this will be more difficult. I first try to find an opening from this proximal end of the common duct into the distal end through some narrow stricture. I cannot, however, find any distinct opening. I therefore try to locate the distal end of the common duct; using the needle and syringe, I locate the distal end by finding a cavity containing a very small amount of mucus, which is drained into the barrel of the syringe. Cutting down on to this I find I have opened the distal end of the common duct beyond the stricture. There is a space intervening between the distal end which I have found and the proximal end of probably $\frac{3}{4}$ inch, which seems to be almost entirely occupied by scar tissue. I take it for granted that about that much of the common duct was clamped or ligated at the time of the first operation and destroyed. There must be, from the history of the case, a small fistulous tract through which bile can still find its way. This, however, I have not been able to locate. The stricture is, to all intents and purposes, like an impermeable stricture of the urethra through which the surgeon has not been able to pass even a filiform bougie. I believe that we can handle this case best by a **T**-tube, one part of the **T** being introduced into the proximal end and one into the distal end, and the main leg of the tube brought out through the external incision, and by bringing the proximal and distal ends as close together as I can with catgut suture (Fig. 179). I now sew the peritoneum over the tube with some fine catgut sutures so as to be sure of maintaining it in position. I then close the external incision, leaving, in addition to the **T**-tube in the common duct, a small cigarette drain.

(The patient stood the prolonged operation very well. Unfortunately, like many of these cases, in spite of the fact that her blood coagulated in fairly good time, about four and one-half minutes, she had more or less continued oozing of blood for the first forty-eight hours. There was a very free escape of bile. At the end of forty-eight hours the oozing ceased, the itching disappeared, and she went on to a very good recovery.)

From my experience with these cases I intend to leave this **T**-tube in for eight or nine months, blocking up the external opening so that the bile will pass into the intestine for a greater part of the time. Then at the end of eight or nine months we shall remove the tube with the hope that a sufficient canal has been established to make a permanent communication between the proximal and distal portions of the duct. At the end of that time I think we may take it for granted that this canal is lined with mucous membrane and that it will persist.

These cases are becoming so common that one feels like preaching on the subject and warning the occasional or inexperienced operator of the great danger of injuring the common duct in cholecystectomy, and of emphasizing again and again the importance of the technic which must be followed in cholecystectomy in order to prevent the possibility of these accidents. Of course, cholecystectomy should not be done by one without the necessary training, and even where it is done by a well-trained man, he must insist that before the cystic duct is clamped or ligated it should actually be seen by the operator so as to prevent the possibility of his injuring the common duct. As one of the points in technic which makes this possible I want again to call your attention to the importance of doing the final steps of a cholecystectomy on the left side of the patient, because it is in that position that the operator can much better see just what he is doing in one of these deep wounds, and from that left-sided

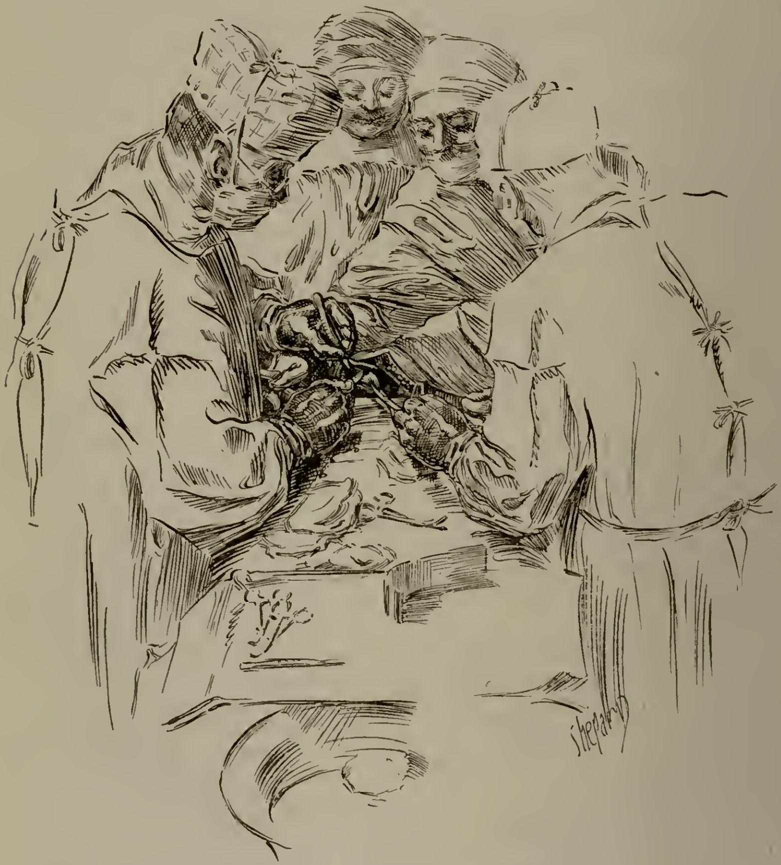

Fig. 180.—Cholecystectomy: while freeing gall-bladder from liver, operator stands on right side of patient. While freeing cystic duct and determining its relation to common duct, operator gains greater freedom of action by working from the left side of the patient.

position it is practically always possible to see actually and separate the cystic duct from all the surrounding structures before it is clamped and ligated (Figs. 180, 189).

In connection with this case, which you have had the opportunity of seeing, I want to refer to a very unfortunate case which I operated upon within the last few weeks. A nurse, operated on by a surgeon whom she had been accustomed to help in the operating room, was operated on first for what was supposed to be gall-stone disease. At the first operation I

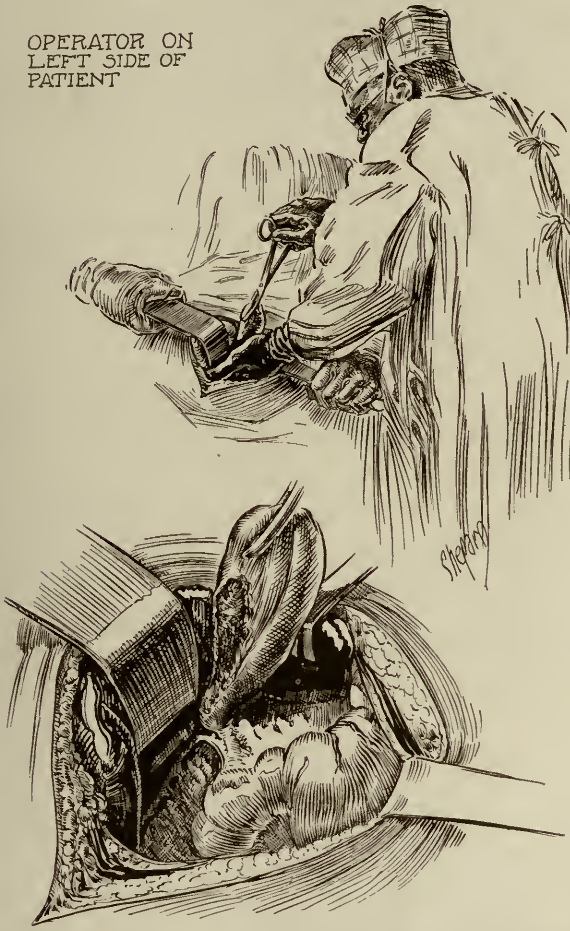

Fig. 181.—Cholecystectomy: while freeing gall-bladder from liver, operator stands on right side of patient. While freeing cystic duct and determining its relation to common duct, operator gains greater freedom of action by working from the left side of the patient.

understand no gall-stones were found and the gall-bladder was simply drained. She improved somewhat, but later she had a recurrence of the symptoms and an operation was done, the surgeon stating that he found very extensive adhesions and that he had to remove a large amount of tissue, including the gall-bladder with adhesions and with a large stone. This was followed some months later by jaundice, which finally became persistent and complete. She was brought to me for examination, and I knew at once that it was a stricture of the common duct following injury from cholecystectomy. Her general condition was fair, her coagulation time was slower than normal, about six minutes, but she was able to be up and about, and for a case of its kind one could describe her condition as fairly good.

I operated upon her as I have done in this case, found the proximal end of the common duct without difficulty, and introduced a **T**-tube as we have done this morning. The patient seemed to do unusually well for two days, and then rather rapidly, within twelve hours, lost ground and died from hemorrhage. A postmortem was obtained and a very considerable amount of blood was found in the peritoneal cavity and a large duodenal ulcer.

I have had 3 or 4 deaths from hemorrhage in these common duct plastics and in bad common duct cases with intense jaundice. For a time we used oxalate of calcium with the hope that that would hasten the time of coagulation and have a tendency to prevent parenchymatous oozing that so frequently occurs in these cases. That, however, I think proved to be of little value. The question of transfusion before operation, of course, should be considered. I believe it is of some value. On the other hand, not infrequently where these badly jaundiced cases are transfused before operation and after operation they nevertheless die of hemorrhage.

I have learned to regard these injuries of the common duct from cholecystectomies and the common duct plastics that are required for relief as almost the most difficult and serious operation that we do in surgery, not only from the standpoint of the risk of the operation, but from the uncertainty of the cure.

I have had to reoperate several of these cases. I have reoperated cases that have been operated upon by surgeons of the widest experience in this work, and my experience has taught me that, even with the best technic and the greatest experience, we cannot assure the patient of a permanent cure. I have now several patients who are wearing **T**-tubes and have been wearing them for some time, perfectly comfortable and happy as long as the **T**-tube is functionating. Unfortunately, however, the life of one of these rubber tubes is uncertain. Few of them last more than a year, and either they have to be replaced or removed and the patient watched to see if a permanent patulous canal has been secured. Sometimes, fortunately, this is done. On the other hand, even in what look like favorable cases after removal of the tube, the scar tissue gradually contracts, and in a few months the patient is in as bad condition as before, and requires another operation and reintroduction of the tube. Of course, the moral, after all, is that we must prevent the occurrence of these accidents. The brilliant operative work that would restore these injured common ducts by an extensive plastic operation is not to be compared at all in value with the careful technic that prevents the occurrence of these accidents. That is the story and the lesson which I would like to give you this morning.

PARAFFINOMA OF NOSE AND LEFT EYELID

Summary: Clinical features and surgical pathology of paraffinomas. Complete excision the only successful treatment.

THE second patient we shall operate upon this morning is an example of a rare lesion. This patient presents the picture of paraffinoma. What do we mean by the term "paraffinoma"? A paraffinoma is a tumor-like lesion that develops about some paraffin injected under the skin, and is, in fact, the reaction of the tissues to the irritation of the foreign body and an attempt to break up encapsulated paraffin into small particles.

Nothing was known of paraffinoma for some time after we began the use of paraffin as an injection for facial deformities, especially for saddle-nose. A number of these operations for deformities of the nose had been done before any case of paraffinoma developed. These paraffinomas do not follow every injection of paraffin into the tissues. In what proportion they do occur I am unable to state. Not infrequently the paraffin injected to correct a deformity of the nose remains certainly for a long period of time without producing any reaction. In some cases, however, this unfortunate and very serious reaction develops, bringing with it a most distressing picture. This patient, as you can see (Fig. 182), has a large paraffinoma of the nose, which is very unsightly and very disfiguring; but, what is vastly more important, he has a paraffinoma of the left upper lid. This evidently was an accident in the injection for the nose deformity; the paraffin evidently was pushed into the tissues under great pressure, and a considerable amount of it found its way into the loose areolar tissue of the left eyelid, and as this chronic inflammatory reaction developed, the left upper eyelid has become a dense unyielding mass of tissue, which prevents absolutely any opening of the left eye. He has been referred to me by one of my colleagues, a specialist in ophthalmology, with the request that I examine the case and do what I can for him, the opthalmologist stating that he is afraid that any surgical intervention will be of no service.

We have had the patient in the hospital for several days, and I have finally decided to make a radical removal of all the paraffinoma tissue of the left eyelid, removing, as we shall be compelled to do, all the skin and make a dissection down to the cartilage of the eyelid and then cover the deformity with a Thiersch graft. I certainly shall not undertake at this time to do anything

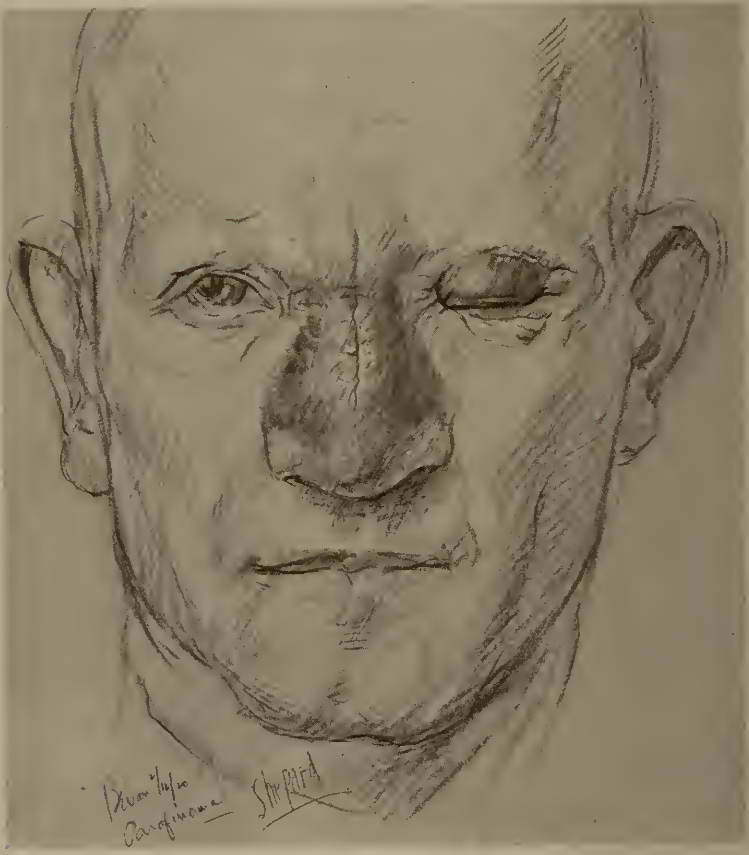

Fig. 182.—Paraffinoma of nose and left eyelid. Note marked disfigurement due not only to the swelling but also to the discoloration of the involved areas.

whatever with the nose. If I can succeed in making it possible for the patient to open the left eyelid even one-half as wide as normally I shall be quite satisfied with the result because it will give him vision in both eyes. I think he himself will be more than satisfied.

It will be impossible, of course, to undertake an operation of this kind under local anesthesia because of the difficulty in infiltrating this tissue. We shall, therefore, select drop ether as our anesthetic. We might find it necessary in the operation to use intrapharyngeal ether, yet I think it will be quite possible for Dr. Herb to give what we call a sterile anesthetic, gown, gloves, and everything sterile, and at the same time not interfere with the field of operation.

I now dissect out this dense mass of tissue (Fig. 183), and as I proceed with the dissection you will see that there is a large wedge-shaped piece of paraffin and new connective tissue enfolding it in the angle between the eyelid and the orbit. In order to make it possible to remove all the involved tissue I am careful to keep my dissection in normal tissue. I can cut down to the cartilage of the eyelid close to the free edge of the eyelid, and here I find something of a line of cleavage between the normal tissue and the involved tissue. It is necessary for me, however, to hug the cartilage pretty closely. As I come up into the angle between the eyelid and the orbit I find that I can take a small, sharp chisel and remove the paraffinoma better with this than I can with the knife. As I approach the inner canthus of the eye I must be very careful not to injure the tear duct. At this point there is quite a large mass of paraffinoma extending from the eyelid to the nose. This I also remove with the chisel, tearing the infected tissue off from the normal tissue. We have now succeeded in removing all the paraffinoma from the eyelid, and I cover the upper eyelid with two Thiersch grafts taken from the back of the left arm. I watch these grafts carefully. There is a little hemorrhage at the outer angle which I control by light pressure for four or five minutes. You will notice that it has now ceased entirely and we can put on a dry gauze dressing.

It has been my fortune or misfortune to handle a number of

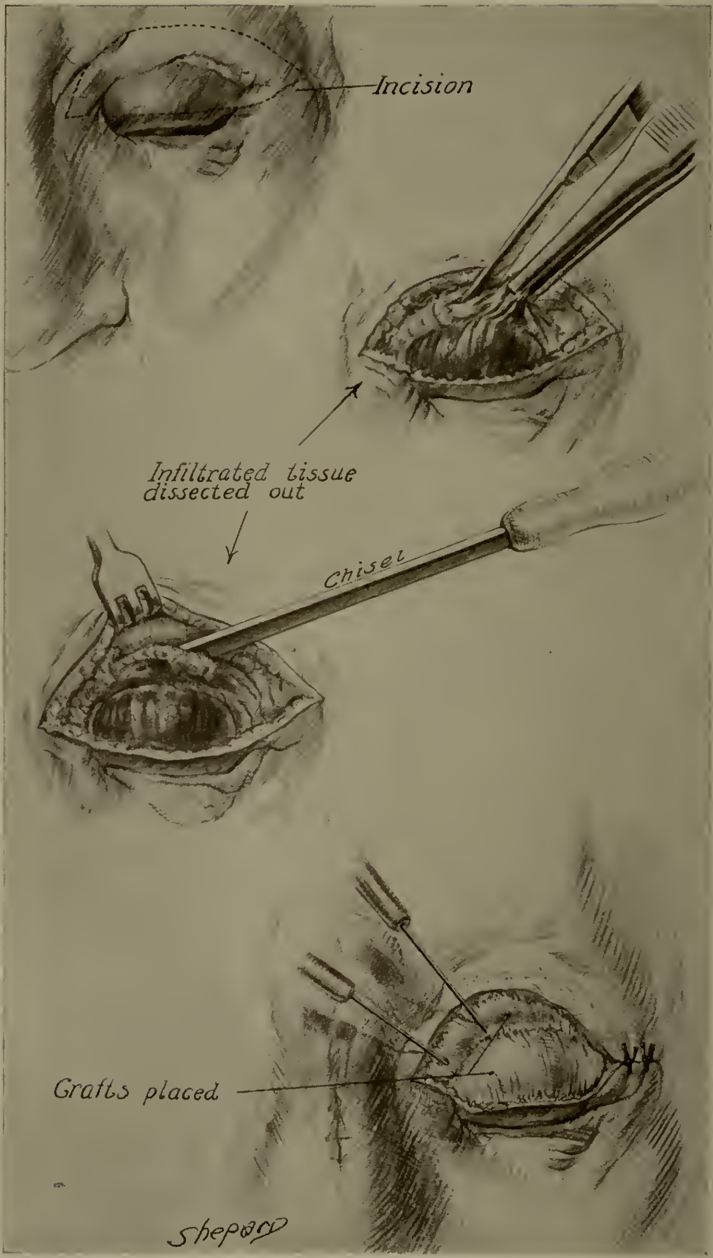

Fig. 183.—Technic of operative treatment of paraffinoma of left eyelid.

these cases of paraffinoma. One of the earliest cases reported was one I saw in connection with Dr. Hyde and Dr. Ormsby. A woman, who had been for years one of the prominent figures in the underworld, getting along in years and being distressed by the wrinkles that had developed in her face and about her eyes, went to a beauty specialist and had a number of injections of paraffin made, some vertical injections which were made between the eyebrows in order to correct some deep vertical wrinkles at that point. Injections were made under the lower eyelid, under the eyes, and oblique injections made on the side of the face, leading down toward the angle of the mouth on each side. She had been much gratified for a number of months by the improvement made in her appearance, the injection having produced no change but a disappearance of the wrinkles. Gradually, however, in each location paraffinomas developed, and when she came to me the result was most startling. When she took her veil off she looked very much like the make-up of the Devil in Faust—very bright red lines between the eyebrows, under the eyelids, and on the sides of the face like red face paint which is employed on the stage in make-up, the only difficulty being that in her case it was beneath the skin and not on the surface and not removable.

This was the first time that I had ever seen this condition, and the entire subject was, of course, new to the profession at that time. After consulting, however, with Dr. Hyde and Dr. Ormsby I finally made some very extensive dissections, removing the paraffinomas, and I succeeded in obtaining a very great amount of improvement; never, however, an entire disappearance of the condition, but an improvement which was very striking. Fortunately, in this case the amount of paraffin that had been injected evidently was very small.

I have seen several other women with very much the same picture, in some of whom the amount of paraffin injected and the reaction resulting was so great that no operation could be considered, and I have had no hesitancy in telling them that they must use a veil and that they would have to be satisfied with concealing the condition as best they could.

I have had several cases in men, and in two of these the amount of paraffin was fortunately limited to an area such that we could remove it entirely by a free dissection. Where this could be done, of course, a very satisfactory result could be obtained. I know of no other way except dissection that is of any service in these cases. In these facial dissections, of course, one must take very carefully into account the question of nerve supply and avoid doing any injury producing paralysis of the facial muscles.

After-history.—The dry gauze dressing was changed at the end of five days and both grafts had taken very nicely. The problem that still remained was as to the amount of function that might be obtained. The levator palpebræ had been useless for so long that the return of function would probably be slow and incomplete. Fortunately, after the lapse of a few weeks, we succeeded in obtaining an excellent result. The left eye can be opened about one-half the normal extent, but sufficient so that the patient can see perfectly with it, and is delighted.

CLINIC OF DR. ALFRED A. STRAUSS

Michael Reese Hospital

INTUSSUSCEPTION

Summary: Diagnosis of intussusception—relative importance of various common symptoms—dependability of the results of fluoroscopic examination. Treatment—methods of reducing intussusception and maintaining reduction—resection in cases of gangrene—end-to-end anastomosis preferable—technic. Theories of the etiology of intussusception. After-care.

This morning we have a child four and a half months old for operation, with the following history obtained from the mother:

The child, previously in good health, was suddenly awakened from sleep, crying out with severe pain. This subsided for a few moments, and then the child screamed again. The paroxysms recurred many times in the next few hours. The child looked very pale, and the mother noticed that it looked very sick, evidently in shock. Two hours after the onset the child vomited several times and had several bowel movements, but no blood was noted in the stool. This morning, ten hours after the onset, the child cries occasionally with pain, but seems better and has more color.

The history is almost typical for intussusception, with the exception that no blood was noted in the stools. I am quite sure if we were to allow this child to go on for another ten to sixteen hours blood would be present in the stools. I might say a few words right here regarding the symptoms.

Symptoms.—The suddenness of the onset is quite characteristic of this condition. The remaining symptoms may vary according to the degree of strangulation of the intestinal and mesenteric circulation and the permeability of the lumen of the bowel. In enumerating the symptoms I shall attempt to classify them according to their diagnostic importance. We find a gradual development of a train of symptoms, reaching their highest intensity within a short time, more often in a perfectly healthy child, though not infrequently we have a history of some intestinal disturbance or, more rarely, one of abdominal trauma. The symptoms may appear while the patient is at rest, in motion, during feeding, or while asleep. In the majority of cases the first symptom noticed is a sudden, violent pain of colicky character, not infrequently appearing to radiate from a definite point. Usually this is followed shortly by vomiting. These two symptoms may be considered to be of constant occurrence in young children. At this time the child usually has one or two bowel movements. They are usually diarrheal in character; later, though not invariably, mucus, bloody mucus, or pure blood may be passed, together with thin liquid bowel contents. At this time or even earlier symptoms of marked prostration may soon be followed by collapse. The pulse becomes small and rapid. The attacks of vomiting usually recur and may become fecal, by which time there is usually no discharge of fecal matter by the anus, though some blood or mucoid material may be evacuated. Tenesmus is frequently a source of great suffering, more especially if the obstruction of the bowel has become complete. A rise in temperature in the early stages is rarely observed, and some cases may show advanced degrees of meteorism.

I want to repeat for the sake of emphasis that *pain* is the first symptom of acute intussusception. Its onset is sudden and colicky in character, usually uninterrupted at the onset, later becoming intermittent. Its location varies with the seat of the intussusception.

Nausea and Vomiting.—This usually occurs simultaneously with the pain or immediately after. The first vomiting may be purely reflex, while later it may become fecal in character, suggesting an obstruction. The vomiting may be continuous or recur at intervals. Invaginations of the small bowel usually produce the more common symptoms of vomiting, while the vomiting is not as constant and not as pronounced in invaginations of the large bowel.

Bloody Stools and Evacuations of the Bowels.—In acute cases we usually have one or more evacuations of fecal matter, which may vary from thin liquid to formed stools, representing the intestinal contents below the obstruction. After this has passed we have complete absence of all fecal matter and flatus if the occlusion is complete. If the congestion of the intestine becomes more marked and inflammation of its walls begin, we have passages containing blood, serum, and mucus. The bloody stools represent one of the most constant symptoms of invagination and are absolutely characteristic of this condition. The amount of blood varies from a few streaks to a profuse hemorrhage which may cause death. If the intussusception is of the subacute type, the hemorrhage may cease for twenty-four hours, only to reappear more marked than ever. When it appears the second time it usually means that we have sloughing of the intestinal wall.

Prostration is one of the most marked and characteristic symptoms of this condition. It is sudden in development and out of all proportion to the other symptoms, especially when associated with great pain. Fever of moderate degree or absence of tympanites should lead one to suspect intussusception.

The *tumor* of an intussusception is a most important physical sign from a diagnostic standpoint. It can usually be felt per rectum, providing it is located in the cecal region or in the sigmoid region. A tumor may be present and be overlooked on account of the presence of tympanites or it may be located in the upper abdomen where rectal examination will not reveal it. By far the largest number of intussusceptions are in the upper right quadrant, and therefore it would be physically impossible to feel a mass by rectal examination. Therefore, as I will show you in a minute, this part of the diagnosis is not so important, particularly since we have a definite means of making a diagnosis by means of fluoroscopic and Roentgen-ray examination.

Meteorism.—This varies with the degree of obstruction of the intestinal lumen and the seat of the invagination. Meteorism is usually late in development, and its absence is of diagnostic importance.

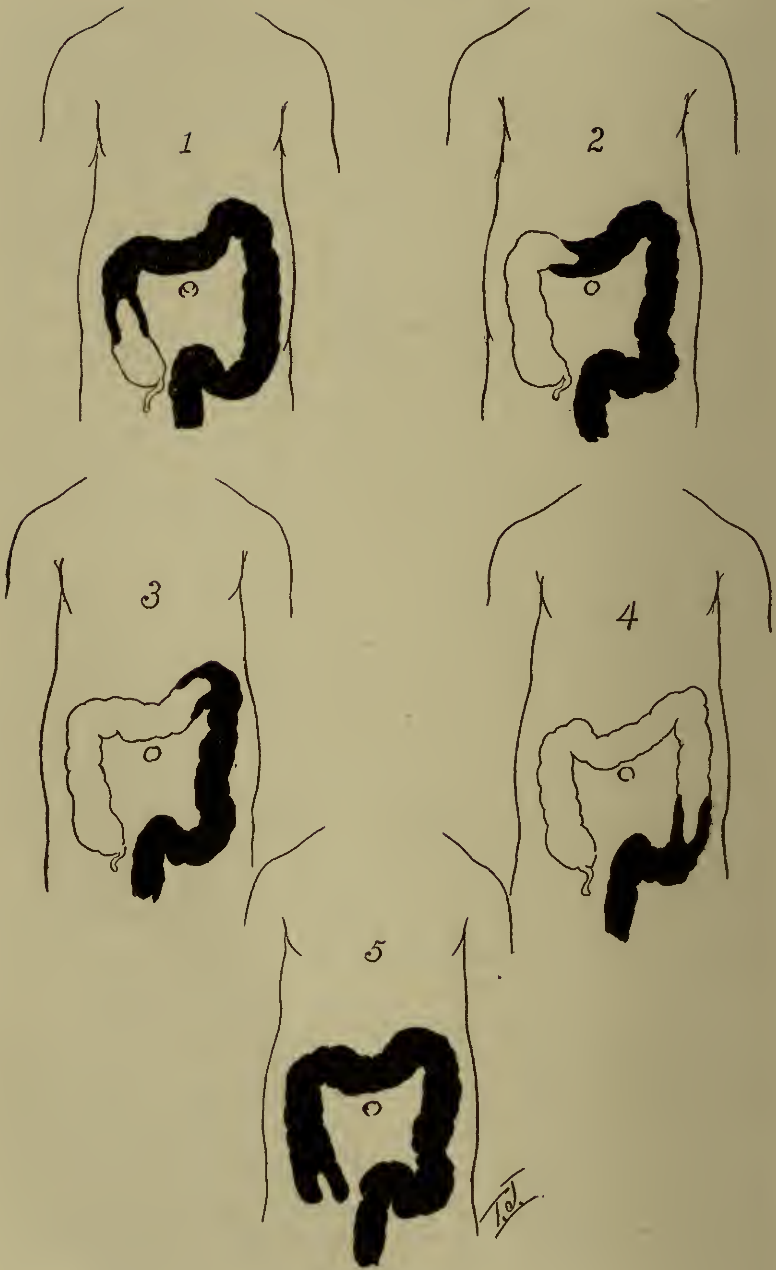

Fig. 184.

Tenesmus is quite common. It is especially severe in intussusception of the sigmoid region and rectum.

Now to refer back to the symptoms of this particular case. The onset is typical, but we lack one very characteristic symptom, and that is the presence of bloody stools. In order to obviate any mistake, we have given this child a bismuth enema. I consider the fluoroscopic examination of such importance that in the last four years I have fluoroscoped all suspected cases of intussusception. This gives you an immediate diagnosis and also shows you in what part of the abdomen the intussusception is located. To have an exact knowledge of the location of the tumor has the following advantages: first, it allows you to make a very small gridiron incision over the area where the tumor has been located by the fluoroscope; second, by being able to make a small gridiron incision right over the intussusception you have a means of preventing evisceration of the bowel, which is almost impossible through a right rectus incision, especially if meteorism is present; third, you do not have to hunt for the intussusception, which saves time and means less manipulation of the bowels, and, therefore, prevents shock; fourth, there is practically no chance for hernia or evisceration following the gridiron incision, while they are not at all uncommon in midline or right rectus incisions.

The technic that Dr. Arens, our roentgenologist at Michael Reese Hospital, and myself have used for giving bismuth enemas is as follows:

A very small (No. 9) rubber catheter is used instead of the regular rectal tube. The small catheter prevents straining and tenesmus. The enema can is held up just high enough to allow the bismuth to flow slowly along the colon up to the point of obstruction. When we notice a point of obstruction we make gentle pressure upon the abdomen at this point to see if we can force the bismuth further along the colon. By doing this we

---

Fig. 184.—The various points of intussusception that have been noted under the fluoroscope and in the *x*-ray plates. The advantage of seeing these is that the operator is able to make a small incision exactly where the intussusception occurs.

get a typical concave shadow (Fig. 184). If no intussusception is present, the bismuth will flow along the colon and will also pass through the ileocecal valve, for we have learned from fluoroscopy in a large number of healthy children that the ileocecal valve is incompetent in practically 99 per cent. of normal children. It not only gives you a means of diagnosing your intussusception in the colon, but it also gives you an immediate diagnosis of intussusception in the lowest portion of the ileum. We recently made a definite diagnosis where we suspected an intussusception with very mild symptoms which we thought was due to a partial obstruction. We found, much to our surprise, that the head of the cecum with the appendix was intussuscepted (Fig. 184, 5).

As you will notice from our roentgenograms of the case this morning, the intussusception is located in the left hypochondrium. This is due partly to a loose mesocolon and a non-rotating cecum. A non-rotated cecum is very commonly found in intussusception, and was present in more than 50 per cent. of the cases I have operated. You will note from the roentgenogram that intussusception can occur in almost any portion of the colon, sigmoid, splenic and hepatic flexures, or cecal region. You also note that it is possible to have an intussusception of the head of the cecum with the appendix (Fig. 184).

Operation.—The operative treatment of these cases requires a great deal of surgical judgment on account of the varying amounts of pathology and the damage produced by the intussusception. The case we have this morning ought to be a simple intussusception, having occurred only ten hours ago.

I will now make a gridiron incision in the right hypochondriac region, although according to the roentgenograms the intussusception is in the left hypochondriac region; but if you will look at the *x*-ray plates carefully, you will notice a long **Y**-shaped bismuth shadow. This I interpreted as the end of a fairly long intussusception, so that the beginning of the intussusception is somewhere in the right hypochondriac region. On opening the peritoneum I find the ileum not distended. The gall-bladder comes into view and appears normal. The colon is very accessible and has a dough-like mass within it, which is the intussusception. By following along the colon I find the intussusception ends in the left hypochondrium, exactly as the roentgenogram showed it. On making pressure with the thumb and index-finger above the intussusception and a slight counter-pressure on the intussuscipiens (a rolling-up movement—Fig. 185), I can reduce it very quickly. I have reduced half the length of the intussusception within the abdomen. I will now lift the balance of the intussusception out of the abdomen to show you the method of reduction. You notice that making pressure above it reduces the intussusception, and you also notice how much easier and more speedily it reduces when I make counter-pressure by intermittent strokes (rolling-up movement). The intussusception evidently was of the ileocecal type, which, as you notice from the constriction of the bowel, started at the ileum about ½ inch from the cecum. I want to call your attention to the long, free swinging cecum, which is of the non-rotated type, extending about 2 inches below the gall-bladder, and I also wish to call your attention to the relation of the ileum to the cecum. The ileum, instead of entering the cecum at right angles, enters almost on a straight line with the cecum (Fig. 186, *B*). The ileocecal valve is very large, which I believe is also an important factor in this type of intussusception.

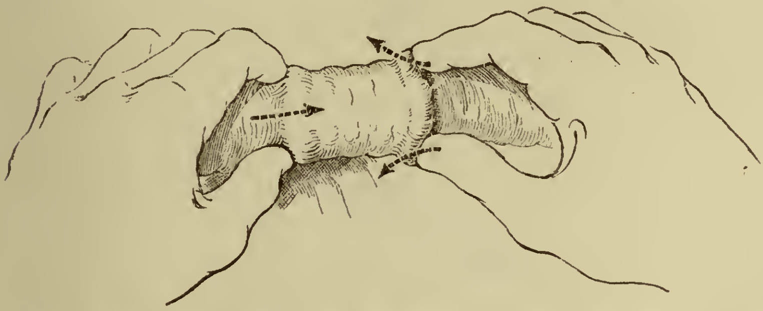

Fig. 185.—Method of reducing an intussusception, the arrows indicating the direction in which pressure is exerted.

To prevent recurrence of the intussusception I will take two strips of peritoneum with a small amount of underlying connective tissue and attach them to the cecum, and two small portions of omental pedicles from opposite directions are attached to the mesentery of the ileum and to the free edge of the ileum opposite its mesenteric attachment. I think this last step is of great importance, and not enough attention has been called to it. It only adds a minute or two to the operation. I have had 2 cases which were operated on previously for intus-

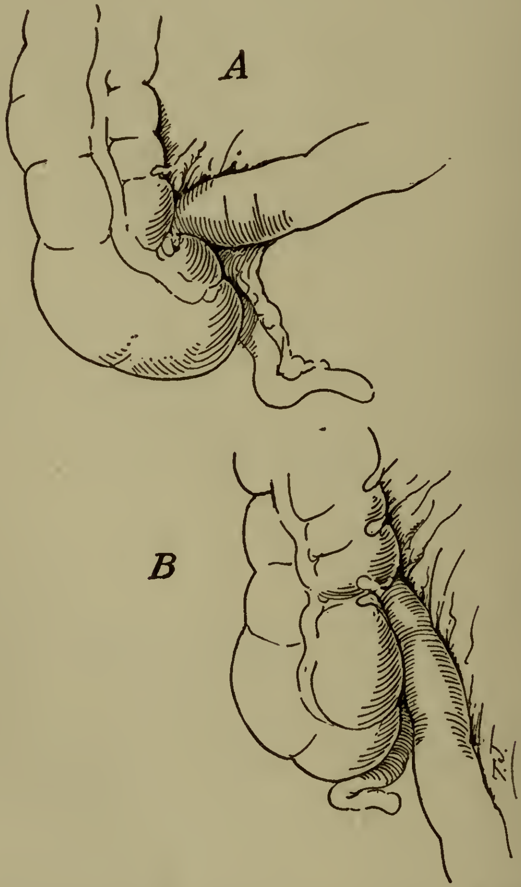

Fig. 186.—*A*, Normal entrance of ileum into cecum. *B*, Ileum entering cecum, with a large ileocecal valve, practically on an axial line with the cecum and colon.

susception, one twelve months after the first intussusception operation, and the other three months after. Hipsley, of Sidney, Australia, reports a large number of cases which were operated on three or four times for intussusception, and one case five times, with perfect recovery. I feel morally certain that by adding this last step I can prevent such recurrences in a large majority of the cases. The abdomen is now closed in the usual manner.

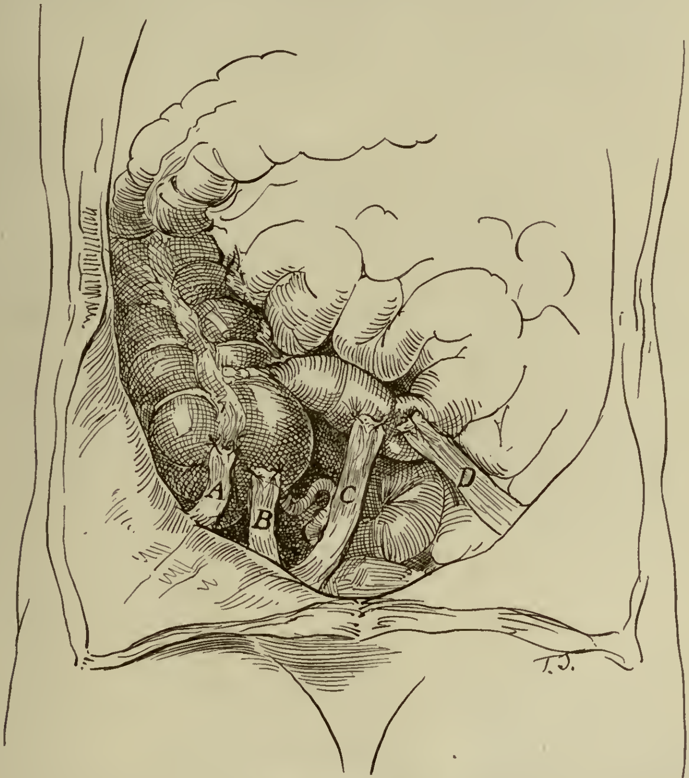

Fig. 187.—The peritoneum with underlying connective tissue attached to the cecum and the first portion of the ileum, making traction in opposite directions.

The type of intussusception which cannot be reduced easily is usually of three or four days' standing, and is usually of a double type, namely, an intussusception of the ileum near the

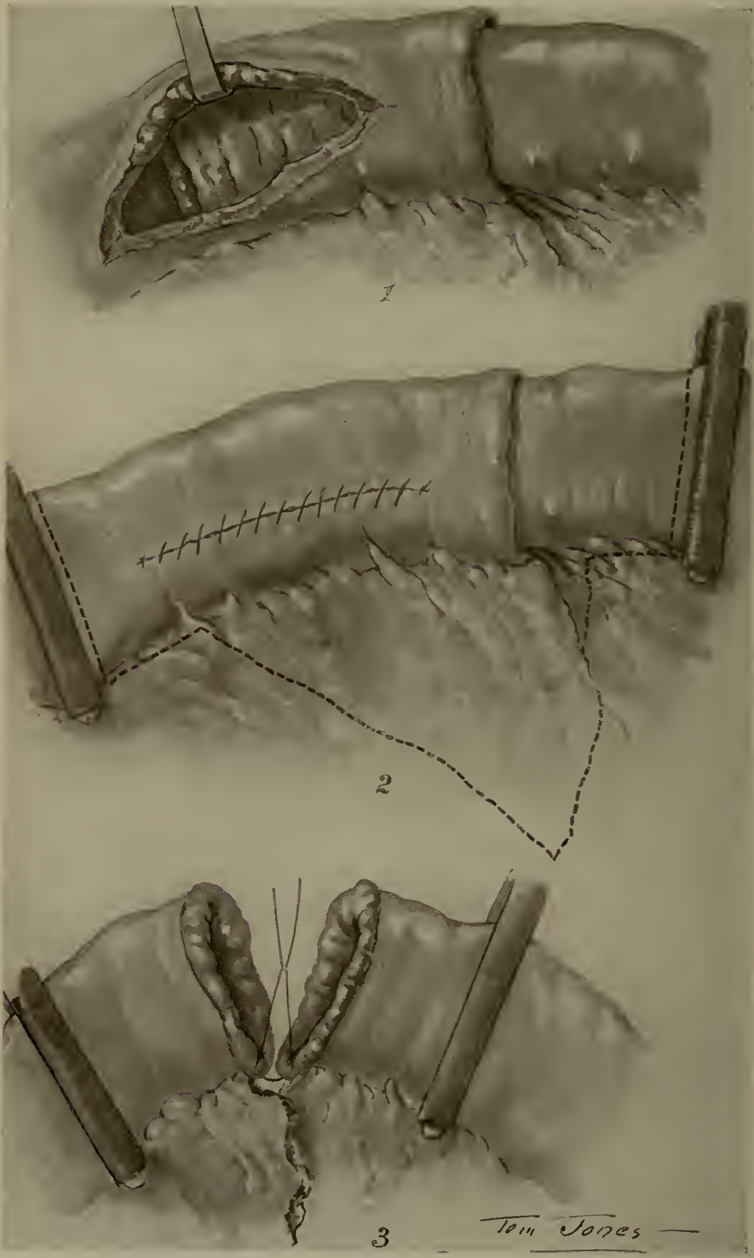

Fig. 188.

ileocecal valve, which, in turns, makes a secondary intussusception through the ileocecal valve, an intussuscepted colon. In this double type the ileocolic portion is usually easily reduced, but not the intussusception of the ileum. If the intussuscipiens appears edematous and the reduction seems impossible, it is advisable to open the ileum and inspect the intussusceptum (Fig. 188, 1). If it appears black and gangreneous, to try to reduce and manipulate such an intussusception is only a waste of time and produces shock and infection. The open bowel should be closed by temporary suture (Fig. 188, 2) and a block dissection made wide of the intussusception (Fig. 188, 2); an anastomosis should be made in the following manner, which completes the operation.

Very soft, pliable, rubber-covered clamps are placed some distance away from the gangrenous bowel. A resection is then made as indicated (Fig. 188, 2) and a second set of clamps are placed some distance behind the first ones, and the first ones removed (Fig. 188, 3), so as to leave 2 or 3 inches of the divided bowel free from the clamp. The amount of mesentery resected should only be that portion that absolutely looks black and gangrenous. That portion that simply shows a slight inflammation should not be resected, but overlapped or used to cover over the suture line after the anastomosis is made. The edges of the bowel are held by four tension sutures placed at four different points on the circumference of the bowel, so as to make traction (Figs. 188, 3; 189, 4). A simple over-and-over suture of black waxed silk is now used, going through all the layers of the bowel (Fig. 189, 5). In 2 cases of resection this was the only suture that was used to make the anastomosis, the suture line being covered with the free edge of the resected mesentery. In these 2 cases the condition of the child was very critical, and for this reason time was not taken to put in the second row of Cushing sutures (Fig. 189, 6). However, I believe the second row of

---

Fig. 188.—1, Method of opening intussuscipiens to inspect the intussusceptum. 2, Closure of intussuscipiens after the intussusceptum was found to be gangrenous, dotted line indicating area of resection. 3, Clamps placed and first guide suture in position for end-to-end anastomosis.

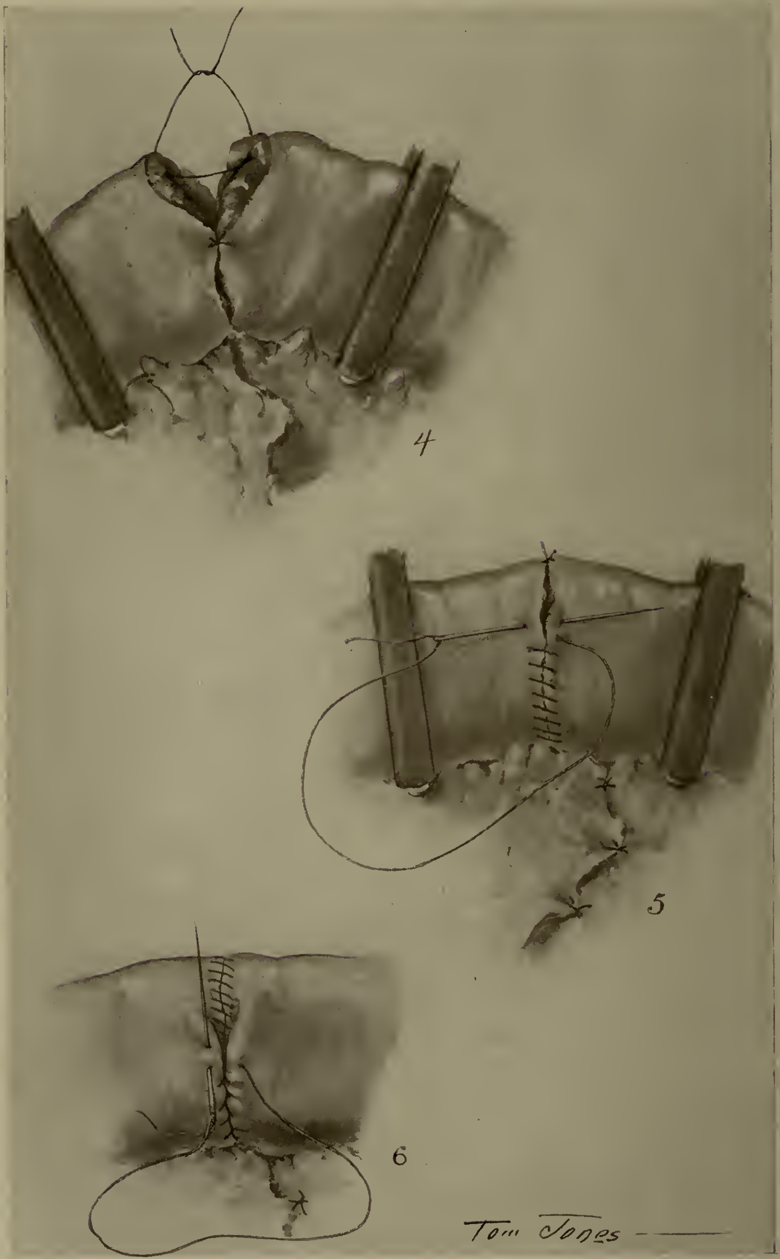

Fig. 189.

sutures makes the anastomosis more safe. In animals I have found that a single row of over-and-over sutures going through all the coats of the small bowel is just as efficient as two or three layers. In these 2 cases of resection, in which I used a single suture for anastomosis, the children made uneventful recoveries. I have several times before resected quite a large portion of the ileum in children whose general condition was poor; and in these cases I used a single row of sutures with perfect after-results. Thus, I believe, the question of a second Cushing suture may in time prove to be entirely unnecessary in anastomosis of the ileum.

I believe that this simple end-to-end anastomosis and resection of the diseased bowel lessens the shock from manipulating the open intussusception and avoids the spread of infectious material from the gangrenous bowel into the general peritoneal cavity; it is far more practical and more physiologic than any other type of anastomosis or operation that has been employed when resection is necessary. I believe the type of operation advocated by Schmieden, where a resection is made of the intussusceptum after opening the intussuscipiens, and the cut end of the intussusceptum is sutured to the inverted intussuscipiens, has the following drawbacks: You are working with a gangrenous bowel, the limitations of which are not sharply defined; second, the point of entrance of the intussusceptum into the intussuscipiens may later cause cicatrization and constriction, producing obstruction; third, the infected bowel may produce enough toxic absorption to produce toxic paresis of the entire intestinal tract, which we see so often in children; fourth, the infectious material escaping during the open operation may cause peritonitis and death.

The advantages of a block dissection are: first, it is simpler without taking longer; second, you get rid of all the pathologic bowel; third, a simple end-to-end anastomosis is more normal

---

Fig. 189.—4, Four tension sutures placed in position. 5, Single row of over-and-over sutures through all the coats of the bowel and the mesentery overlapped. 6, Second row of sutures in position. These are placed after the manner of the Cushing stitch.

and more physiologic and has no tendency to produce a constriction.

Pathology.—Very little need be said about the pathology. It varies with the amount of obstruction of the blood-vessels and the amount of constriction and pressure produced in the wall of the bowel by the intussusception. It varies from slight edema and infiltration of the bowel wall to ulceration, gangrene, and sloughing of the intussusceptum.

I would like to say a word here regarding what I believe is a mistaken idea regarding the time element in intussusception. I have seen several instances where the surgeon advised against operation because the intussusception occurred seventy-two hours previously and the child was distended. In one intussusception of only ten hours' standing there may be as much or more damage as in another case at the end of seventy-two hours. While the time element is of some importance, of much more importance is the type of intussusception and the amount of constriction produced to the blood-vessels and to the walls of the bowel. We find a similar condition in strangulated hernia. A hernia may be down for a number of days with practically no constriction of the bowel or to its blood-supply, while another one may be black and gangrenous in ten or twelve hours. These variations depend, first, on the length of the mesentery of the intussusception, and second, on the location of the intussusception. The ileocecal type of intussusception does not become black and gangrenous as quickly as an ,intussusception of the ileum. The majority of true intussusceptions of the ileum show a tendency to become edematous and gangrenous much quicker than the first-mentioned type.

Etiology.—I believe the difference in the rapidity of growth between the colon and the ileum during the early months of life, the abnormal relationship of the colon to the ileum, and abnormal contractions or peristaltic waves are important factors in the cause of intussusception.

1. The colon and ileum are almost the same size at birth. The colon grows in width so much faster that at the end of the fourth to eighth month, the common age at which intussusception

occurs, the colon is three or four times as wide as the ileum. This rapid growth is usually accompanied by a large ileocecal valve, which practically allows the ileum to prolapse into the cecum.

2. The colon in cases in which intussusception occurs usually has a long, free-swinging mesentery, and so has the ileum. This allows the ileum to swing in the direct or long axis of the colon (Fig. 186). As I have mentioned before, the cecum in many of these cases is of the non-rotated type, which usually means a long-swinging mesentery. During the developmental period of life the intestinal tract has many abnormal contractions and movements which have to be developed during the developmental period of the nervous system. This probably explains the unusual contractions that we see in early life; for instance, the pylorospasm which produces the hypertrophy and irregular tumor of congenital pyloric stenosis is a good example of this type. I believe that the tonic contraction of the bowel during this developmental period bears a similar relation to that seen in pyloric stenosis and probably is the starting-point of all intussusceptions where no foreign body or tumor is present. When this tonically contracted loop of bowel moves forward by the swinging of the ileum the relaxed bowel in front of it practically pulls itself over the tonically contracted bowel. This acts as the starting-point, and a series of such contractions pushes the tonically contracted portion of the bowel forward, as a foreign body would be pushed forward. This process keeps on as long as the loose mesentery will allow the tonically contracted bowel to move forward, and the intussusception will be as long as the mesentery will allow. To repeat, I think the important factors in causing intussusception are: first, the unusually large caliber of the colon and cecum in comparison to the small ileum; second, a large ileocecal valve and the loose and free-swinging cecum and ileum, allowing the ileum to swing in a straight line with the cecum and ascending colon, producing a prolapse of the ileum into the cecum; third, the abnormal tonic contractions of the ileum and cecum during this developmental period.

After-treatment.—As to the postoperative treatment of these cases, I would like to call your attention to the importance of blood transfusion if the child is in severe collapse. In 4 cases in which I did a block resection by the method illustrated in Figs. 188 and 189 the children were in severe shock and collapse. A blood transfusion was performed in each case through the superior longitudinal sinus (through the anterior fontanel) by a 100 c.c. Luer syringe and a Brown needle. I find this very simple and efficient. I believe if you transfuse these children with 100 or 150 c.c. of blood taken from the mother before operation, you prevent shock to a great extent. In 2 of my cases of resection I did a second transfusion twelve hours after operation. All 4 cases made uneventful recoveries. The blood does not have to be tested in very young children up to one year of age. In a large number of cases that we have transfused for other conditions we have had no ill-results from transfusing from mother to infant without testing out the blood.

The after-treatment is no different from that employed in any abdominal surgical condition. I believe in supplying the patient with fluids subcutaneously or through the superior longitudinal sinus, either with blood, when the condition is critical, or with 3 per cent. glucose solution. I think many infants can be saved following these operations if transfusion is resorted to. The diet should be about the same as that employed in cases of acute appendicitis. Cathartics should not be used. It is much better to use low 1–1–1 enemas for a few days after operation.

CLINIC OF DR. EDWARD LYMAN CORNELL

CHICAGO LYING-IN HOSPITAL

OCCIPITOPOSTERIOR POSITION AT TERM

Summary: Presentation of four patients. Discussion of diagnosis, complications, and general management.

WITHIN a week 4 occiput posterior cases have come on my service, 3 of them being delivered today. The management of occiput posterior positions is exceedingly important for the reason that fetal mortality and maternal morbidity are exceptionally high. There are, perhaps, more babies lost in these cases than in any other single obstetric presentation. The reason for this is the failure on the part of the physician to understand thoroughly the mechanism of labor in the posterior position and his failure to make a diagnosis previous to the onset of labor or early in labor. The high mortality and morbidity are especially seen in cases delivered by forceps. This is due to one or more of the following facts: (1) Frequently the forceps are misapplied; (2) the traction force is misdirected; (3) the forceps are used as rotators of the head without a perfect understanding of the principles regarding such use. In occiput posterior cases, for example, the right, the early mechanism differs considerably from occiput anterior. In occiput anterior, you will recall, the head rotates through an arc of 45 degrees, while in occiput posterior it is necessary to rotate through an angle of 135 degrees, as you will see in Fig. 190. The uterus must force the head to rotate through this greater arc. It requires considerable force and often much time to accomplish this, because the head is practically stationary. That is to say, the head does not move outward sufficiently to permit an easy turn. A mechanic will tell you it is easier to turn a moving object than one which is stationary. This is admirably demonstrated by the driving of an automobile. It is difficult to turn the front wheels while the car is standing still, but it is exceedingly easy to turn them while the car is in motion. The occiput posterior case can be compared to the car standing still, while the anterior position is compared to the car in motion. In the former, the occiput descends very little during the early rotation, hence the extremely difficult and tedious first stage so often seen. It is in the management of the early stage of this condition that the judgment of the obstetrician is frequently severely taxed. Therefore one should understand fully the mechanism of labor. I will briefly review this for you.

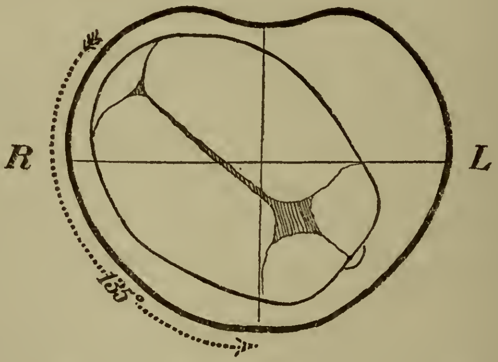

Fig. 190.—The occiput must rotate through the 135° arc when it is located posteriorly.

The first stage in labor is the engagement. In right occipito-posterior presentation the occiput engages in the right oblique with the occiput pointing posteriorly, usually slightly forward of the sacro-iliac joint. Along with the engagement is a certain amount of descent with flexion. As soon as the head strikes the pelvic floor there is an attempt to rotate anteriorly. This occiput has to rotate 90 degrees farther than the anterior presentation. In this increased rotation the descent is no further than it would be in occipito-anterior. Therefore, the head travels in a circular manner three times as far with the same amount of descent. This requires considerable force on the part of the uterus and very often a great deal more time, which accounts for the fact that these patients are in labor so long, especially the primipara. After rotation is completed anteriorly, the mechanism of labor in both right occipito-anterior and posterior is the same. The head descends and the occiput impinges under the symphysis. Extension occurs along with descent and the perineum begins to bulge. With the continuation of this process the head is born over the perineum. With the rest of the mechanism you are all familiar.

A few points in the diagnosis of this condition may be mentioned. Every case in labor should be thoroughly examined at the earliest moment. In this hospital, on admission, the blood-pressure is taken, the abdomen is palpated, the presentation and position determined, a rectal examination made, and an estimate given of the baby's weight. Upon external examination in occipitoposterior cases we find that the small parts are felt in profusion in the anterior portion of the uterus. In the type of which we speak they are located on the left side of the patient. They are usually easily palpated, especially between contractions. The fetal heart tones are usually located well out in the flank on the right side at the beginning of labor. As labor progresses and the head rotates anteriorly the heart tones are best heard along a line drawn diagonally from the original location of the tones toward the center of the pubes. Upon palpating the head abdominally above the inlet a marked depression is usually noted on the left side and none on the right. This is due to the fact that there is a depression between the head and the chest. Upon rectal examination, especially if there is some dilatation of the cervix, the sagittal suture will be found in the right oblique instead of the left, as would be expected in an anterior position. The large fontanel is noticed close to the pubes and the head is usually located higher up. There is another fact I place considerable importance upon, a point seldom mentioned in textbooks. The external os in the occipitoposterior cases is usually located high up in the sacral hollow. I have come to the conclusion that this is a very valuable sign in the rectal diagnosis of occipitoposterior cases.

Labor may also terminate in another manner. The occiput may rotate posteriorly through an arc of 45 degrees and deliver as such. This is known as "persistent occipitoposterior." The mechanism in this type is long, tedious, and fraught with considerable danger to the child due to excessive trauma to the head. It is also likely to be more disastrous to the mother as far as damage to the vaginal tract is concerned, because the larger diameters of the head are brought into relation with the anteroposterior diameter of the pelvis after rotation is completed. In this method of delivery the forehead instead of the occiput impinges under the symphysis and the occiput has to pass over the hollow of the sacrum. In order to do this the shoulders must enter the pelvis at the same time. This crowds the pelvic canal, stretching it to a greater degree, and also forces the uterus to develop more power to push this compact mass through the pelvis. It is in this type that the more severe perineal and vaginal tears are seen.

I wish to briefly outline 3 cases seen previous to this particular patient.

Case 9996, primipara, aged twenty-three, at full term, went into labor at 4 P. M., December 23d. On admission to the hospital the presentation was diagnosed as occiput right posterior. The patient was having good contractions every three to five minutes. She was complaining of considerable pain in the back. Rectal examination at 12.10 A. M., December 24th, showed that the cervix was effaced and dilated 3 cm. The external os was located opposite the third sacral vertebra in the hollow of the sacrum. At 4.30 A. M. the cervix was dilated 8 cm. The head did not descend. At 5.10 A. M. a vaginal examination was made and the cervix manually dilated to 9 cm., using gentle force, and the bag of waters was ruptured. The patient had been complaining bitterly the last four hours of severe backache. The child's weight was estimated at 7 pounds, 12 ounces. Ether was given the patient during the pains and she was allowed to labor for an hour after the bag of waters ruptured. By that time the occiput had rotated to the right transverse position. The uterine contractions were very severe and Bandl's ring was forming quite rapidly; in fact, the uterine contractions were so severe that I was fearful of the life of the child as well as of rupture through the lower uterine segment. As the head was in the transverse diameter the patient was put to sleep and the forceps applied in such a manner that the left blade was placed over the left cheek of the baby, well in front of the ear. The right blade was placed over the occiput, so that the forceps were in the left oblique diameter. Traction was made downward and a slight rotatory motion given to the blades from left to right. As soon as the sagittal suture was found to be in the right oblique diameter the forceps were reapplied to the sides of the fetal head without removing them. Traction was applied in a downward and outward direction until the occiput impinged under the symphysis. The pull was then outward and upward in a wide arc. As soon as the head was brought to the perineum and bulging took place, a deep oblique episiotomy was performed on the left side. In spite of this precaution there was an extensive tear upward through the vaginal mucous membrane on the left side. There was also a tear in the vaginal mucous membrane 2 inches in length on the right anterior vaginal wall. Tears can seldom be avoided in primiparæ. Almost invariably where forceps are used as a means of rotating the head tears occur even in the hands of experts. The vaginal mucous membrane was immediately repaired with a continuous forty-day catgut and the episiotomy was repaired with buried catgut using subcuticular silkworm-gut in the skin. This baby weighed 8 pounds, 4¼ ounces and was in good condition. The mother was in good condition when she left the table.

The first patient delivered today (December 31st), Case 10127, entered the hospital at 11.30 P. M. yesterday. She is twenty-eight years old, para II, the first labor resulting in low forceps September 25, 1918, due to uterine inertia. The pains began at 9.30 P. M. on December 30th. After sixteen hours of labor we found that the cervix was effaced, the os dilated 8 cm., and the head well engaged, with the occiput in the right posterior. The bag of waters was bulging through the cervix, so that its efficiency as a dilator was gone. It was artificially ruptured at

12.45 P. M. After the rupture of the bag of waters the pains became much stronger. The patient was allowed to labor one and a half hours longer, during which time there was practically no descent of the head. The patient was complaining of the severe pains in spite of the fact that ether was administered during the contraction. It was decided to deliver by means of forceps.

On vaginal examination after the patient was asleep it was found that the head still remained in the right occipitoposterior position. To apply forceps in this position and use them to rotate the head through an arc of 135 degrees would necessitate two applications, with removal of the blades between. This is fraught with considerable risk of severe tears. I endeavor whenever possible to avoid a double application of the forceps. In a large percentage of cases this is successful. Rotation of the head manually can frequently be accomplished. If not, it may be rotated by use of a volsellum forceps grasping the skin over the occiput. A third method is to push the head out of the pelvis, passing the left hand up to the anterior shoulder, and rotating the shoulder past the midline to the left side of the uterus. This carries the occiput with it. The occiput is grasped as the hand descends and the head is drawn into the right anterior position. This can be done under light anesthesia, so that the uterine contractions which follow can push the head down where forceps may be easily applied, The head may be pushed down from above by placing the right hand over the lower uterine segment and making pressure in the axis of the inlet. In this latter method it is possible to grasp the scalp with a volsellum, in which case the assistant holds the head in the right anterior position by making traction on the volsellum while the forceps are being applied to the sides of the fetal head.

In this particular patient manual rotation of the occiput was easily accomplished from below. The occiput was rotated to the transverse position and the forceps applied as in the previous case. When traction downward with slight rotatory motion was made, the head rotated inside the forceps in such a manner that at the end of two tractions the head was in the anteroposterior diameter. This frequently happens. It avoids reapplication of the forceps. An episiotomy was done through the old scar on the left side and, in this case, there was no extension of the tears through the vaginal mucous membrane, nor was any other damage done to the vagina or cervix.

The estimate given on the baby's weight was 7 pounds, 6 ounces; its actual weight was 6 pounds, 12 ounces. This patient was in the first stage of labor for sixteen and one-half hours, during which time there was marked molding of the head. This child's head was markedly elongated, a condition known as dolichocephalus.

The next patient, No. 10,130, was twenty-six years old, para V. Her first labor was instrumental, the rest normal. The pains began at 8 o'clock this morning and she was admitted to the hospital at 3.30 this afternoon. At that time it was noted that the position was right occipitoposterior. The cervix was thick and effaced, with practically no dilatation. The head was not engaged. It was estimated that the baby weighed 8 pounds. Rectal examinations made at 6 and 8 P. M. showed 3 and 6 cm. dilatation respectively. The external os was located posteriorly in the hollow of the sacrum. A vaginal examination was made at 9 P. M. and the cervix was found to be thick and dilated 9 cm. The bag of waters was intact. It was artificially ruptured. The pains were irregular and not strong. At 10 P. M. the cervix was completely dilated and the pains still irregular and weak. At 10.03 P. M. she was given 2 minims of Parke-Davis' pituitrin. The pains immediately picked up and the head came through rapidly. At 10 o'clock the head was still in the occipitoposterior position. As a result of the pituitrin the fetal heart tones became slower, a little irregular, but always strong. The baby was born at 10.24 P. M., the occiput having rotated anteriorly. The baby weighed 7 pounds, 7¼ ounces and was in good condition. This baby had a slight caput succedaneum over the right parietal bone and there was some overriding of the sutures.

The patient about to be delivered, No. 10,131, is twenty-nine years old, para II. Her first labor resulted in low forceps. The pains began at 3 P. M. today and she entered the hospital at 5 P. M. Rectal examination made at 5.15 P. M. showed that the cervix was thick and effaced, with no engagement of the head. The baby's estimated weight was 6 pounds. The bag of waters was intact and the external os of the cervix was located opposite the second sacral vertebra. The pains were irregular, from five to eight minutes apart, and rather weak. The occiput is in the right posterior position.

The nurse will now scrub the patient and at the same time boil up the Hillis instrument for rupturing the bag of waters. This instrument is a long trocar with a round end and a small, sharp projecting point on its upper surface (Fig. 191). The Hillis instrument is grasped in the right hand and passed into the vagina with the projecting point upward. It is guided into place by the fingers of the left hand. The membranes are pierced between pains. This is done to prevent, as far as possible, the cord from prolapsing. The rush of water under pressure frequently carries the cord with it. The membranes are thick and as the cervix is completely dilated they are of no further use. You notice that the pains are irregular and weak, coming from

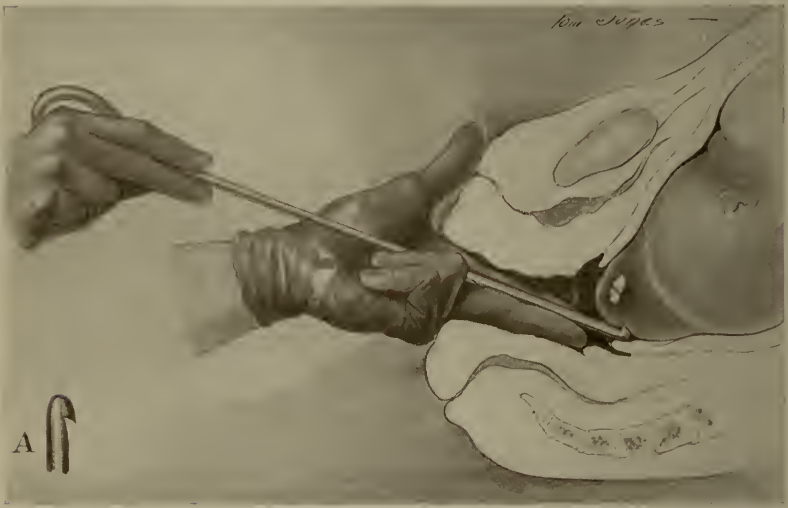

Fig. 191.—Method of inserting the Hillis instrument. The hook is fastened to the membranes and pulled upward and outward. This prevents the fetal head from being injured. *A*, Head of Hillis instrument.

five to eight minutes apart. We will give 3 minims of Parke-Davis' pituitrin. It is now 11 o'clock. At 11.04 we have one good sharp pain. The patient notices the difference. At 11.06 another and at 11.08 a third. At 11.10 the pain is weak. The next pain, at 11.15, is a weak one. At 11.18 the pain is still weak. We will give another 3 minims of pituitrin (11.20). You note that the pains are now picking up rapidly. The fetal heart tones are slower and are becoming irregular. The fetal head is advancing rapidly. There must be some interference with the circulation in the cord; we are able to watch the heart tones frequently since using the head stethoscope. In order to hasten delivery we will do an episiotomy on the left side through the old scar. The assistant will administer ether, crowding it as the head dilates the perineum. The baby is born occipito-anterior at 11.33. We find that the cord is around the neck once and it fits so tightly that it is impossible to lift it out over the child's head. In fact, we have difficulty in loosening it from around the neck. We will clamp and cut it. Two clamps are used, as it is impossible to determine which end of the cord is attached to the child. We cut between the clamps. The shoulders come out in the anteroposterior position and the child cries lustily. The patient is now allowed to wake up from the ether. The placenta separates easily, but there is considerable bleeding. This means that we have either a vaginal tear high up or that the placenta is being delivered by the Duncan method. The nurse will give 1 c.c. of pituitrin subcutaneously. The placenta is born spontaneously at 11.37 in the Duncan manner. This rather rapid bleeding is still continuing, so we will clean the perineum carefully and make a vaginal examination. We find that the lower uterine segment is filled with clots. These are removed. The uterus does not contract well, so we will inject 1 c.c. of pituitrin directly into the uterus through the abdominal wall. For this we use a 1¼-inch heavy needle. The left hand is placed in the uterus and the intestines and bladder are pushed out of the way. The nurse paints the skin with tincture of iodin about half-way between the pubis and umbilicus and inserts the needle at a right angle to the skin. The inside hand notes the position of the needle. It is now in the uterus, having passed through the skin and the structures intervening. The pituitrin is injected. The first thing noted by the inside hand is an area about the size of a twenty-five-cent piece, which becomes very firm. In about thirty seconds this spreads to an area the size of a half-dollar, and then suddenly the uterus contracts. You must be careful not to get the hand caught in the uterus at this time, as the contraction is usually very firm. On removing the hand any clots of blood should be brought out at the same time. You notice that the uterus now stands up in the abdomen and that the bleeding has practically stopped. We note that the vagina is not torn. We will now repair the episiotomy wound, using buried catgut sutures and subcuticular silkworm-gut in the skin.

I wish to call your attention to this placenta. It is the type known as placenta circumvallata. You note here a thick fibrous band which completely encircles the placenta on the fetal surface. It is located about $\frac{3}{4}$ inch from the outer portion of the cotyledons. This is due to the fact that the ring of Waldeyer probably prevented the placenta from growing outward. There are several views regarding the cause of this condition. One is that there are inflammatory changes in the decidua which cause various grades of necrosis, thus temporarily preventing the growth of the placenta. Another is that the placenta is located either in the cornua of the uterus or along the internal os, and that the placenta grows faster than the rest of the uterus. A third view is that endometritis causes adhesions of the decidua reflexa to the vera, and a fourth, that there is a sudden diminution in the liquor amnii, causing the covering of the ovum to shrink. These placentæ circumvallatæ are of importance clinically because hemorrhages sometimes occur, usually early, producing abortion. The cord in this case is eccentrically attached and the membranes are complete.

AFTER-HISTORY

The first patient (No. 9996) left the hospital on January 3d, feeling well. Her highest temperature was 99.2° F., on the first day. The highest pulse was 96 on the day of operation. The baby left the hospital in good condition. It weighed 8 pounds, 1⅛ ounces. Examination at the end of six weeks showed that the cervix was closed firmly, the uterus in proper position; the vagina showed scars resulting from the tears; the episiotomy wound was in good condition.

The second patient (No. 10,127) left the hospital on the twelfth day in good condition. Her highest temperature was 98.6° F. and highest pulse 84. The baby's highest temperature was 99.4° F. on the fourth day. Its weight was 6 pounds, 14 ounces. Examination six weeks after delivery showed that the uterus was in good position and that the episiotomy wound had healed nicely without any cupping.

The third patient (No. 10,130) suddenly developed a temperature of 101.8° F. on the fourth day after delivery. At the same time she complained of considerable pain in the left groin. She had symptoms of a thrombophlebitis in the left leg, but it cleared up rapidly. The baby's highest temperature was 99.8° F. on the third day.

The fourth patient (No. 10,131) left the hospital on the thirteenth day, her highest temperature being 99° F. and highest pulse 90. The baby's highest temperature was 99° F. on the ninth day. The baby's weight was 6 pounds, 5⅛ ounces. Examination six weeks after delivery showed the episiotomy wound in good condition and the uterus in proper position.

A CASE OF OCCIPITOPOSTERIOR POSITION COMPLICATED BY LOBAR PNEUMONIA AND FRACTURED RIB

THIS patient was first seen by me December 18, 1919. She is thirty-four years old, para IV. She has been married for fourteen years and is a Christian Scientist. Her last period was April 16th. In June, July, and August she spotted for one day only. Her family history is negative. She was operated upon for an ovarian cyst on the right side fourteen years ago and the appendix was removed also. She was cureted five years ago; for what purpose is not known. Her first pregnancy was normal and the baby weighed 6 pounds. The second was normal, the baby weighing 8 pounds. The third labor was instrumental, the baby weighing 9¾ pounds. At this delivery she was badly torn. There was no repair. Since her last delivery she has had pain in the back and in the legs. Her health in December, when I first saw her, was poor, apparently because she was unable to sleep on account of the pains and cramps in her legs. There was no nausea or vomiting to speak of. She had swellings from the ankles to the knees and an occasional headache. She was very constipated and her appetite was fair. She also had some pains in the lower abdomen. The blood-pressure was 128 systolic and 76 diastolic.

Shortly after I saw her the weather became very cold and her apartment was inadequately heated. She said that it was difficult to keep the temperature even around 54° F. On the 24th of December I was called to see her and found her suffering from a left lobar pneumonia, the entire left lobe being involved. At that time I advised the hospital, but she refused, as she wished the services of a Christian Science practitioner. On December 30th I saw her again. The left lung was still involved and there was apparently some pleurisy with effusion. Her condition, however, was somewhat better. On January 6th I was called again, as she complained of severe pain in the right side, which came on suddenly after a severe attack of sneezing. A diagnosis of fractured rib on the right side was made. The patient stated that she had had no bowel movement for seven days. She also had severe cramp-like pains in the lower abdomen and in the legs. She refused to take medicine, stating that she would soon have a bowel movement with the aid of Christian Science. She was in bad condition at that time, and I strongly urged the family to move her to the hospital, but without success.

On the morning of January 9th I was informed that the patient was entering the hospital. Upon admission she was in very poor physical and mental condition. She entered the hospital with a fractured rib, no bowel movement for ten days, with nausea and vomiting which had kept up for twenty-four hours. The vomitus now contained blood and bile and had a slight fecal odor. She had lost a great deal in weight. She had a temperature of 101° F. Her pulse was rapid and weak. The left lower portion of the chest was dull to percussion and evidently contained some fluid. The baby was apparently in good condition, near full term, and an occipitoposterior. It was decided to allow the patient to remain in bed for a few hours to recover somewhat from the trip to the hospital and then to induce labor.

As you will notice by her general appearance, she is not a good risk for serious operative work if it can be avoided, and yet I think you will agree that she should be delivered promptly. During the interval between her admission and removal to the operating room at 5 P. M., a matter of some six hours, she has had a milk and molasses enema with no result, a 1-2-3 enema with no result. The exertion of these enemas has been anything but salutary, so that further efforts to produce a bowel movement have been thought inadvisable. You will note that the abdomen is markedly distended with gas and the patient is still vomiting, in spite of the fact that we have given large quantities of soda solution by mouth. I have purposely refrained from washing the stomach because I feel that her condition is such that the inconvenience of passing a tube would react to her disadvantage. As she has been vomiting she will automatically wash out her own stomach if large quantities of soda solution are given.

The problem that confronts us is how to handle this serious complication with the best result to mother and baby. Shall we deliver from below or from above? I feel that delivery from above offers considerable more risk to the mother than we are justified in taking. In all probability she still has pneumococci present in her blood and at least in the lungs, and she might get a general peritonitis or an abscess in the uterus or abdominal wound, so that we will reject this method. There remains, therefore, delivery from below. How shall it be accomplished?

The cervix on examination is effaced and admits the finger readily. No doubt it can be dilated without much trouble because this is her fourth pregnancy. There are no scars to interfere very much with its dilatation. We might dilate manually and do a version, bringing down the foot. This necessitates putting the patient asleep, allowing her to wake up, and perhaps later giving another anesthetic; in other words, subjecting this patient to two anesthesias. In her present condition this risk should be avoided if possible. Another method would be to insert the bag, using some pressure. Taking everything into consideration I believe that this is the proper method to pursue in this particular instance. We will, therefore, insert the bag. We find, on vaginal examination, that we are able to dilate the cervix rather readily, the dilatation being accomplished by gentle maneuvers of the fingers in such a manner that pressure is exerted on the entire periphery of the cervix, that is to say, the hand is turned so that the fingers never press the same spot twice in succession.

I have succeeded in dilating the cervix to 4 cm. The patient is complaining somewhat, but not sufficient to be harmful. An 11-cm. bag is inserted at 5.20 P. M. We will now put a 1-pound weight on it. This is done by attaching a cord or tape to the end of the bag, carrying it over the foot of the bed, using a pillow to catch the weight in case the bag comes out. We will allow a reasonable length of time for the dilatation to be completed.

Rectal examination at 7.30 P. M. shows the cervix dilated to 7 cm. The patient is having pains, somewhat irregular, and the baby's heart tones are in good condition. We will allow her to continue a while longer and endeavor to obtain complete dilatation. The patient's pulse is becoming more rapid, she is still vomiting, and, all in all, her general condition is gradually becoming worse. We will increase the weight on the bag to 2 pounds. This is not a general procedure because a weight of this size prevents the cervix from obtaining its proper circulation, and in some cases it might produce serious results, such as sloughing after delivery. I feel that in this case, however, brisk procedures are indicated provided they are not extended over too great a period.

Rectal examination at 8 P. M. shows that the bag is nearly ready to come out. We will now get ready for delivery. The outfit for vaginal cesarean section is being prepared. I am doing this in order to be ready to meet any emergency that might arise. The patient is placed on the operating table and the bag removed. We find upon vaginal examination that we have about 8 cm. dilatation and that the cervix is rather firm and thick and that the head presents midplane in the right occipitoposterior position. The patient's pulse is rather weak (116). An attempt at delivery will now be made.

The head is rotated anteriorly, using the left hand. It is kept in position by the assistant making deep pressure over the inlet abdominally. The patient is given a combination of nitrous oxid, oxygen, and ether. Forceps are applied obliquely and traction is made downward and out. This brings the head forcibly against the cervix and we find that the cervix is tight and does not dilate readily. We will now make Dührssen incisions in the cervix at 10, 2, and 6 o'clock. The incisions are carried about 1 inch or 1½ inches up the cervix at these points. At the next traction the head comes through rather rapidly, but as it is not molded to any extent, you will notice it is with considerable difficulty that the occiput is brought down under the pubis. Because of the severe laceration she received with the last delivery it is not necessary to do an episiotomy. As the head comes down over the perineum we use plenty of time and slip the head out gently. The forceps are removed and the baby's mouth wiped with mouth swabs and the assistant places his hand on the fundus of the uterus. The nurse will now give 1 c.c. of pituitrin subcutaneously. We will do this before the placenta is delivered because we do not wish this patient to lose much blood, and second, this is an induction of labor and we are liable to have uterine inertia at this point. The baby is in good condition and the shoulders are delivered readily. The baby is born at 8.35 P. M. The patient is bleeding rather profusely, probably from the cervical incision. The uterus does not contract well, and as the bleeding is keeping up we will make a vaginal examination and determine its source. We find the lower uterine segment filled with clots and the placenta presenting by the Duncan method. We will assist in its delivery by making pressure from above, gently pulling on the body of the placenta from below. In order to avoid any further loss of blood we will inject 1 c.c. of pituitrin directly into the uterine wall through the abdomen. The uterus now contracts firmly. You will notice that the patient's bowels are now commencing to move very freely. It is very fortunate that we have no episiotomy or other repair work to do. We will not repair the cervical incisions because of the patient's history of a recent infectious disease. Usually the bleeding from these incisions is very slight and easily controlled without suturing. It is really surprising the amount of fecal matter which is being discharged.

After-history.—The patient's highest temperature was 101° F. on the fourth day. She was given nothing by mouth and 10 per cent. glucose solution in normal salt solution per rectum by the Murphy method. Eighteen hours after this was started it was found that she was unable to retain the liquid per rectum and that the vomiting had ceased, so small quantities of water and liquids were given by mouth at intervals. In thirty-six hours the patient was much better and requested some food. She was placed on a soft diet for three days, at which time her temperature was normal and her general condition was much improved. Her diet was gradually increased, and by the seventh day she was eating the regular hospital food. She insisted on nursing the baby, and it was placed to the breast on the fourth day. She was up out of bed on the thirteenth day and discharged on the fifteenth day in good condition. The rib was not entirely healed and the left lung was in much better condition.

Examination at the end of six weeks showed the cervix to be in fair shape, only slight depressions remaining where Dührssen incisions were made. The body was in good position and the patient was rapidly regaining her strength. She was nursing the baby and it was doing well.

CLINIC OF DR. DANIEL N. EISENDRATH

Michael Reese Hospital

TUBERCULOSIS OF A HERNIAL SAC WITH A BRIEF CONSIDERATION OF ABDOMINAL TUBERCULOSIS IN GENERAL

Summary: Etiology, pathology, diagnosis, and treatment of the more common varieties of abdominal tuberculosis.

The case which I present to you today especially illustrates the difficulty of recognizing tuberculosis of the peritoneum in some of its clinical pictures. The entire subject of abdominal tuberculosis is one which should be carefully studied by every surgeon, because the disease may masquerade as acute or chronic appendicitis, as salpingitis, as a cecal tumor, as ascites without apparent cause, and as a number of other conditions which we are accustomed to think of as being of non-tuberculous origin. It will be impossible today to give you more than a bird's-eye view of such a large number of diseases, but even with this perspective you may stop and consider the possibility of a tuberculous infection as the underlying cause of clinical pictures which one usually associates, like ascites, with diseases of non-infectious origin, or like the other forms of abdominal tuberculosis, with conditions which are due to organisms of the ordinary pyogenic group.

Presentation of Case.—This patient, a man of fifty-seven, was admitted to the surgical ward three weeks ago complaining of the recent discomfort caused by a large right-sided inguinal hernia, which had been present for many years without causing any symptoms. He had never worn a truss and had made no effort to keep the hernia reduced. Examination of the man before operation did not disclose anything which would lead one to suspect an unusual condition in connection with the hernia. The abdomen was not distended or tender and there was a complete absence of subjective symptoms except those referable to the hernia. The latter was reducible, moderately large, and had no special features to distinguish it from hundreds of other inguinal herniæ which one encounters in a large metropolitan hospital.

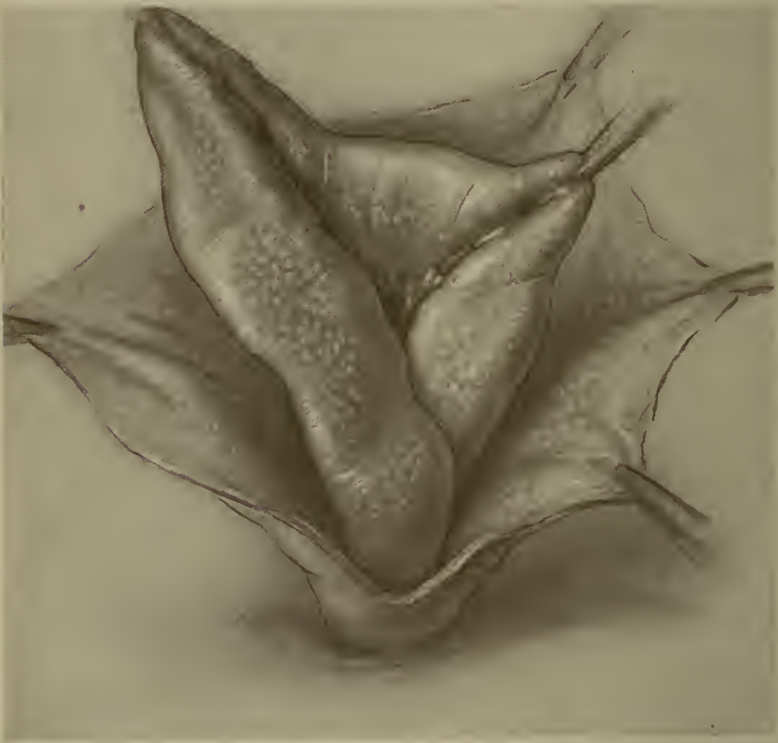

Fig. 192.—Appearance of open sac in case of tuberculosis of the hernial sac. Note miliary tubercles upon serosa of the coil of intestine found in sac, and also upon the inner aspect of the sac itself.

The operation was done under local ($\frac{1}{2}$ per cent. novocain) anesthesia. The sac was very thick, and upon opening it we were greatly surprised to find that the interior of the sac was studded everywhere with pearly white millet-seed-sized nodules with a general reddening of the entire peritoneum (Fig. 192). A similar change was visible in the serosa of coils of ileum which constituted the contents of the sac. Upon retracting the edges of the neck of the sac, at the internal ring we found that the same condition was present on all of the visible parietal and visceral peritoneum. The latter was much thicker and more injected than normal, was rough, and had lost its characteristic normal luster. From this description alone and a glance at a drawing made at the time of operation (Fig. 192), it will not be difficult for you to make a diagnosis of tuberculosis of the peritoneum of the "dry," *i. e.*, non-exudative type, which had caused no general abdominal symptoms.

The local manifestations of discomfort referable to the hernia were insufficient to lead one to suspect generalized tuberculosis of the peritoneum.

Although this is my first case of tuberculosis of a hernial sac, I find that the condition is by no means a rare one. Hertzler, in his excellent monograph,[1] gives a thorough review of this subject.

Collective papers have appeared at intervals since 1849, when the first cases were reported by Cruveilhier. Only one case was diagnosed before operation. The changes in the hernial sac represent as they did in our case simply a continuation of the more generalized involvement of the peritoneum.

The thickening of the hernial sac, as in our patient, is the same as one encounters in the parietal peritoneum of the majority of cases of tuberculous peritonitis.

The variety of hernia does not play a rôle because such changes may be found in any form of abdominal hernia. You will understand the reason for this when I discuss the subject of tuberculous peritonitis in general, and will agree that it is exceedingly difficult to make a diagnosis before operation. No doubt the chronic inflammatory changes in the serosa of the sac and contents of this patient's hernia were the immediate cause of his applying to the surgeon for operative relief.

The neck of the sac was ligated high up, as is our custom, and the operative procedure did not differ from that used in an ordinary—*i. e.*, non-tuberculous—case. The wound has healed by first intention.

---

[1] Diseases and Treatment of the Peritoneum, vol. ii, p. 693, 1919.

We have examined the patient for a possible primary focus since the operation, and have found a very suspicious area in the apex of the left upper lobe, but so far have not found any tubercle bacilli in the sputum.

CONSIDERATION OF ABDOMINAL TUBERCULOSIS IN GENERAL

Fifteen or twenty years ago when one spoke of abdominal tuberculosis it was generally understood that tuberculous peritonitis constituted practically the only form of localization of the tubercle bacilli in the abdomen. Since that time, as a result of many contributions to the subject, we have learned that there are a number of other localizations of the tubercle bacilli which can give rise to quite independent clinical pictures and which are not necessarily followed by tuberculous peritonitis. I shall first consider the various abdominal viscera in which tuberculosis may occur, and then discuss briefly our present views in regard to abdominal tuberculosis. Tuberculosis of the genito-urinary tract in the male and of the urinary tract in the female will not be included, since these belong under a separate heading.

A very convenient grouping is as follows:

1. Tuberculosis of the liver and spleen.
2. Tuberculosis of the alimentary tract:
    - (*a*) Stomach.
    - (*b*) Small intestine.
    - (*c*) Appendix.
    - (*d*) Cecum and ascending colon.
3. Primary tuberculosis of the mesenteric lymph-nodes.
4. Tuberculous salpingitis.
5. Tuberculous peritonitis.

The first tradition which we must discard in this subject of abdominal tuberculosis is that the symptoms of any of the above localizations appear in an insidious manner and develop slowly. There has been much confusion because of the generally prevalent opinion that abdominal tuberculosis cannot appear under the picture of an acute disease. This has led to many errors of diagnosis, and not infrequently, as I shall show you later, cases have been operated upon as acute appendicitis, intestinal obstruction, salpingitis, etc., which, in reality, were only the acute form or mode of manifestation of abdominal tuberculosis. It is of interest in this connection to note that Kayser found that of 39 cases of tuberculous peritonitis of all varieties, 14 began in an acute manner, and in only 25 was there a gradual development of symptoms. Of 13 cases of ileocecal tuberculosis, 2 began in an acute manner. In primary tuberculosis of the mesenteric lymph-nodes not only Kayser, but a number of others, including myself, have described an acute mode of onset, to which I will refer later, which resembles in every respect that of acute appendicitis, or other right-sided acute abdominal affections. Of 10 cases of tuberculosis of the tubes observed by Kayser, 5 had as acute an onset as we are accustomed to see in ordinary acute pyogenic salpingitis.

Tuberculosis of the Spleen and Liver.—This occurs either in miliary form or as a local tuberculosis involving the bile-ducts, or as a solitary tubercle. The miliary form usually occurs in connection with generalized miliary tuberculosis and does not present any symptoms especially referable to the liver. The same is true of tuberculosis of the bile-ducts. A solitary tubercle also presents no characteristic symptoms and does not occur as often in the human being as in the lower animals. It is very exceptional for tuberculous masses in the liver to be sufficiently large to be felt through the abdominal walls during life. I shall refer later to the frequent association of cirrhosis of the liver with tuberculosis of the peritoneum, but there is nothing about this form of cirrhosis of the liver which enables one to recognize it as an independent affection from the accompanying tuberculosis of the peritoneum.

Tuberculosis of the spleen occurs in practically the same pathologic forms as that of the liver. The miliary form cannot be recognized as an independent disease, and it is very rare for the other variety, namely, localized tuberculosis, to be sufficiently large to be recognized during life.

Tuberculosis of the Alimentary Canal.—(*a*) *Stomach.*—Broders has recently made an extensive study of the subject, and finds that gastric tuberculosis may be divided into six types: (1) Early single or multiple; (2) miliary tubercle; (3) solitary tubercle; (4) direct stenosis; (5) single or multiple tubercle or nodule; (6) lymph-nodes.

Ulcer is the predominating lesion and most frequently involves the lesser curvature. It is never primary in the stomach, and there are no characteristic symptoms to enable one to distinguish it from an ordinary non-tuberculous ulcer.

(*b*) *Small Intestine.*—This is usually, like tuberculosis of the stomach, secondary to the same disease elsewhere in the body. It is almost always present in cases of pulmonary tuberculosis and less frequently after tuberculosis of the male or female genito-urinary tract. That it may, however, occur as a primary affection there can no longer be any doubt. Under these circumstances it is assumed that the tubercle bacillus passes through the intact wall of the intestine, usually the ileum, without leaving any trace of its passage. This form is most apt to occur in children as the result of the ingestion of milk or butter containing tubercle bacilli. It is estimated that about 10 per cent. of the cases of tuberculosis in children have such an origin. The tubercle bacillus is usually of the bovine type, and after passing through the wall of the intestine enters the mesenteric and retroperitoneal lymph-nodes, giving rise to symptoms of tuberculosis of these structures, which will be described later in connection with the acute forms of tuberculosis of the mesenteric lymph-nodes.

Carlson in a recent paper on this subject distinguishes two groups of tuberculosis of the small intestine, namely, (*a*) the simple tuberculous ulcer, and (*b*) the stenosing or tumor type. About 95 per cent. of the cases belong to the first named group. As I have just stated, the ulcers are a very common finding in the autopsies of patients dying from pulmonary tuberculosis and are of surgical interest only if perforation, fistula, fecal abscess, or ileus occurs. The second or stenosing type may lead to chronic obstruction of the intestine. So far there have only been about

100 cases of this tumor or stenosing type published. The pathology of this form is very much like that of the tumor form of ileocecal tuberculosis, and I will refer to it under that heading.

So far as the symptoms are concerned, there may be none in either the ulcerative or tumor form of intestinal tuberculosis. Usually, however, there is diarrhea which is very obstinate, and one must always suspect such a complication in pulmonary tuberculosis if there is more fever and emaciation than the pulmonary focus would account for. The diagnosis is confirmed by finding tubercle bacilli in the stool. Involvement of the overlying peritoneum is quite common. During a visit to one of the surgical clinics in the East I saw a case of acute intestinal obstruction due to stricture following such an annular tuberculous ulcer.

The clinical picture of the second type is that of an enterostenosis of gradual onset, quite similar to that seen in ileocecal tuberculosis. For a long time we have indefinite abdominal symptoms, such as diffuse pain, etc., and later this becomes more localized and severe, and not infrequently one is able to palpate a tumor in the vicinity of the lowermost portion of the ileum. To sum up, the surgeon is interested in the complications of ordinary annular tuberculous ulcer, and also in the second and more recently observed form in which there is a tumor formation with gradual narrowing of the lumen of the gut.

(*c*) *Appendix*.—This may occur in the acute or chronic form. The former occurs in connection with tuberculosis of the ileocecal nodes under the clinical picture of acute appendicitis, as I have already described. In a number of these cases only microscopic examination will enable one to say that the tuberculosis of the appendix was the primary involvement. The chronic cases of tuberculosis of the appendix are most frequently associated either with tuberculosis of the cecum or tuberculosis of the peritoneum. The chief sources of infection are the same as those outlined in connection with mesenteric lymph-node tuberculosis, namely, ingestion of milk, cheese, and butter from tuberculous cows. These form an ideal medium for the proliferation of the tubercle bacilli. Butter is a greater danger than milk; 60 per cent. of the cases of tuberculosis of the appendix show tubercle bacilli of the bovine type. I have seen a number of cases in which the patients gave a history of having had an appendectomy after an apparently acute appendicitis, followed within a few months (Figs. 193, 194) by evidences of a diffuse or encapsulated tuberculous peritonitis. There is no longer any doubt in my mind that these were cases in which the appendicitis was of tuberculous nature and removal of the appendix alone did not suffice to check the process. There are on record a number of cases in which removal of the indurated and inflamed tuberculous mesenteric lymph-nodes at the same time that the appendix was removed resulted in complete recovery without the development of secondary peritonitis.

(*d*) *Cecum and Ascending Colon.*—This form of tuberculosis was first called to our attention by Durante in 1890. It may begin gradually, so much so that there is nothing characteristic about the clinical picture until a tumor is found. This may in some cases be preceded by local pain and a little later by symptoms of chronic intestinal obstruction. Some of the cases are operated upon in the early stages for chronic appendicitis, and not infrequently, even in the tumor cases, the diagnosis is not made unless microscopic examination follows. I have recently operated upon such a case, in which the patient gave a history of rather acute onset three weeks before entering the hospital. When first seen in our ward the clinical picture was that of a subsiding attack of acute appendicitis. Upon opening the abdomen, however, I found the wall of the cecum enormously thickened and such dense adhesions to all the surrounding structures that it was not difficult to make a diagnosis of tuberculosis of the cecum with secondary involvement of the appendix. As a rule, the tumor is hard, nodular, and sharply demarcated toward the rest of the bowel, and looks like a neoplasm. In a few cases the tumor is spindle shaped and there is a gradual transition of the indurated tissue into the normal type. As was observed in my own recent case, the appendix may often be included in the process and the adhesions to the adjacent tissues and to the omentum, and the presence of a mass of enlarged lymph-nodes aid in forming an irregular tumor. If one can find caseous lymph-nodes in the mesentery of the ileocecal region, or small subserous tubercles, the diagnosis is easy, but in many cases it is only possible to differentiate it from carcinoma by microscopic examination. In advanced cases the wall of the cecum is enormously thickened, especially the submucous and subserous coats. The tendency to caseation and ulceration is not very great, the chief characteristic being an excessive increase in the connective tissue of the bowel wall, hence the condition is frequently called "the hyperplastic form of ileocecal tuberculosis."

The condition occurs between the ages of ten and sixty. The clinical picture is that of a slowly developing stenosis plus tumor of the cecum and ascending colon. There is little or no temperature, as a rule, unless there are complications, such as abscess formation, fistula, or similar conditions due to perforation of the wall of the cecum with involvement of the adjacent tissue, especially of the abdominal wall.

The condition is often mistaken for carcinoma, sarcoma, syphilis, and actinomycosis. Tuberculosis runs a much slower course than either carcinoma or sarcoma, and is less sharply demarcated than carcinoma toward the adjacent bowel wall. The differentiation from syphilis and actinomycosis is very difficult before operation unless fistulæ are present in which the ray fungus is found.

Unless operated upon the stenosis increases and ulceration of the cecal wall with fistulous formations occurs. Radiographic examination is of great aid in making a diagnosis of this condition, but does not always render it possible to distinguish tuberculosis from sarcoma, carcinoma, syphilis, or actinomycosis.

Primary Tuberculosis of the Mesenteric Lymph-nodes.—This may occur in either an apparently primary or secondary form. The latter is not infrequently a complication of tuberculosis of the small intestine in children or young adults and involves the mesenteric and retroperitoneal lymph-nodes. As I have stated under the head of Tuberculosis of the Small Intestine, the tubercle bacilli may penetrate the wall of the intestine without leaving any trace, the mesenteric lymph-nodes under these circumstances undergoing in some cases caseation, in others the pathologic process seems to tend more toward the hyperplastic form of enlargement, so that quite good-sized tumors can be palpated through the abdominal wall. I have recently shown you a case in connection with the subject of tumors of the abdomen,[1] in which such an indurated mass lying at the root of the mesentery in a young man of twenty, caused us to think of the possibility of a neoplasm.

If the mesenteric and retroperitoneal lymph-nodes are involved, the absorption of fat from the intestine is decreased, resulting in marked emaciation, anemia, fever, and a continuous type of fatty stools so characteristic of what was formerly termed "tabes mesenterica."

This secondary or diffuse involvement of the mesenteric lymph-nodes is not accessible to surgical interference, and its non-operative treatment will be taken up a little later in my lecture in connection with the treatment of abdominal tuberculosis in general.

The primary form of tuberculosis of the mesenteric lymph-nodes is a subject of great interest. The clinical picture in many cases resembles that of acute appendicitis and gives an involvement of the nodes almost as an apparently primary process. I have called attention to this subject in a paper on the acute forms of abdominal tuberculosis, published in 1909. I collected at that time a number of published cases in which the onset was so sudden that it was impossible to make a diagnosis before operation of the tuberculous nature of the condition. The most common seat of trouble is the ileocecal group, and the pathologic changes vary from acute enlargements of the nodes with small areas of caseation to complete caseation or, in some cases, hyperplasia, or as a terminal condition calcification of the nose.

Apparently primary mesenteric lymph-node tuberculosis occurs most frequently between the ages of ten and fifteen. In some the onset is not so acute as to resemble an acute appendicitis. We have only anemia, caseation, or night-sweats to lead one to suspect an occult tuberculosis. In three-fourths of the cases, however, pain is present as a most important initial sign and may be accompanied by high fever. The differential diagnosis in these cases must be made from acute appendicitis chiefly.

---

[1] Surgical Clinics of Chicago, Vol. III, No. 4, p. 915.

It is of interest in this connection to say that Harte and Rabinovitch found the bovine type of tubercle bacillus in 83 per cent. of these primary cases of tuberculosis of the mesenteric nodes. Strictly speaking, these cases are not primary cases, and the focus either exists in the wall of the intestine or appendix, so that the tubercle bacilli migrate through the intact wall. The fact that they are of the bovine type shows that they enter the lymphatic circulation following the ingestion of milk or butter containing tubercle bacilli.

Tuberculous salpingitis involves either the mucous membrane lining the fallopian tube or the peritoneal covering. The latter is usually a complication of a general tuberculous peritonitis. The involvement of the interior of the tube results in some cases in early closure of the fimbriated end with the retention of caseous débris within the lumen of the tube quite analogous to the pathologic changes which occur in gonorrheal salpingitis. In a relatively larger number of cases there is a tendency toward hyperplasia of the wall of the tube with marked diminution in its lumen, so that tumors are formed which greatly resemble in their pathology that described earlier in my lecture as being so characteristic of the ileocecal and certain types of intestinal tuberculosis.

Tuberculous Peritonitis.—I have postponed the discussion of this portion of the subject because it is impossible to understand why tuberculosis of the peritoneum is invariably a secondary localization of the organism unless one possesses some information in regard to the atria of infection.

The most satisfactory division of these primary foci is into: (*a*) those in distant portions of the body, *i. e.*, extra-abdominal, and (*b*) those within the abdominal cavity (exclusive of tuberculosis of the urinary tract in the female and of the genito-urinary tract in the male).

In the first group the bacilli reach the peritoneum, as a rule, through the blood-stream, *i. e.*, the infection is a hematogenous one. In the second group the bacilli involve the peritoneum either by the continuity of the infection in the tissues or by way of the lymphatics, or as the result of a rupture of a tuberculous mesenteric lymph-node. The most frequent extra-abdominal primary foci are the lungs, cervical lymph-nodes, bones, epididymi, kidneys, etc. The most common intra-abdominal sources of infection are the appendix, the small and large intestine, the fallopian tubes, mesenteric lymph-nodes, spleen, liver, and stomach.

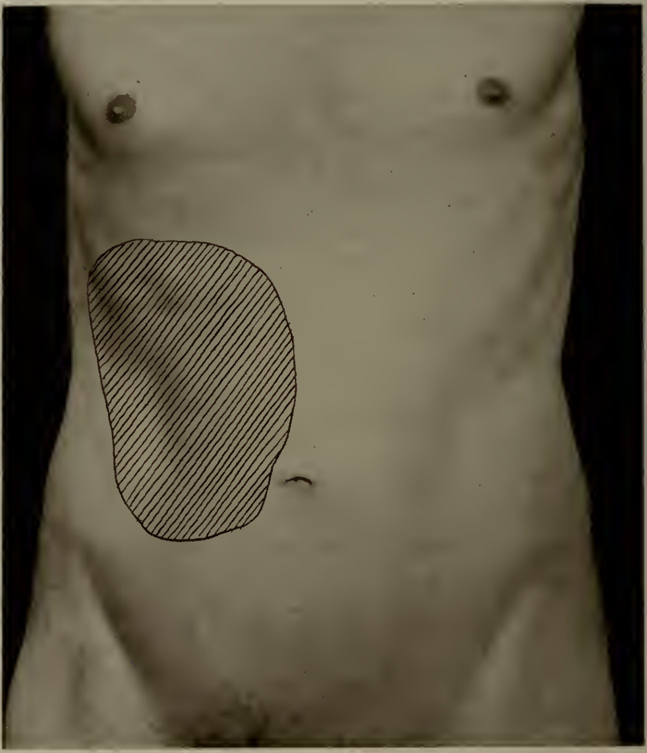

Fig. 193.—Shaded area represents dulness in a case of encapsulated tuberculous peritonitis. History of acute onset six months before, simulating an acute appendicitis. At operation a large quantity of purulent fluid evacuated from cavity whose walls were formed by agglutinated coils of intestine showing typical tuberculous changes.

The clinical pictures vary according to the pathologic changes, hence it is advisable to speak of three forms of the disease: (*a*) The cases in which there is free fluid, *i. e.*, the ascitic form, (*b*) those in which there is an encapsulated fluid (Figs. 193–195), and (*c*) those in which there is no exudate. Some writers prefer a division of the cases into the (*a*) exudative, (*b*) the adhesive, and (*c*) the nodular types. This is excellent from the standpoint of pathology, but I have always found the division just given easier to associate with the clinical pictures as we encounter

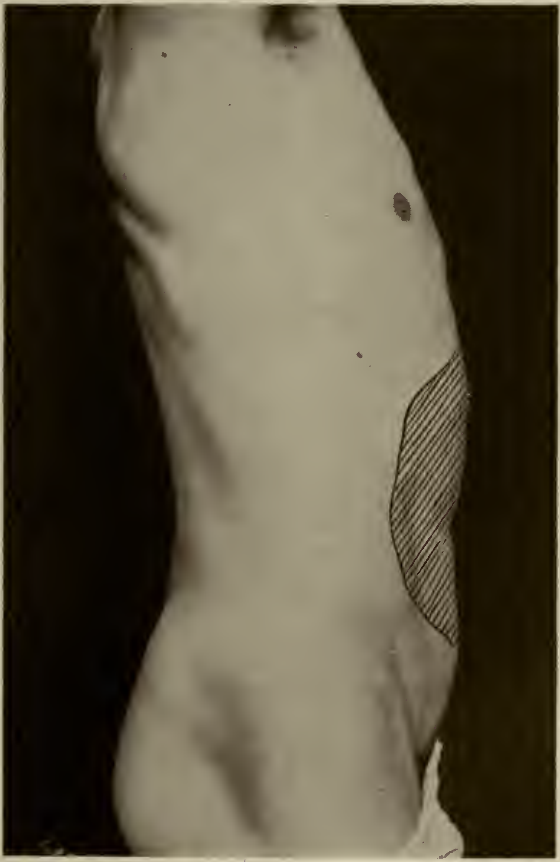

Fig. 194.—Side view of the same case shown in Fig. 193. The stomach and intestines were adherent to each other and pushed toward the left and backward by the encapsulated collection of tuberculous pus.

them at the bedside. You must understand, of course, that there is no sharp line between these three forms, the cases with free ascites may appear at a later period of the disease with encapsulated fluid. Again, the dry or adhesive type may reveal at operation only adhesions and tubercles in some cases, while in others, in which the infection is a more virulent one, instead of miliary tubercles we find nodular masses in all stages of caseation. I will describe the pathologic changes and clinical pictures together and discuss the diagnosis in conjunction with these.

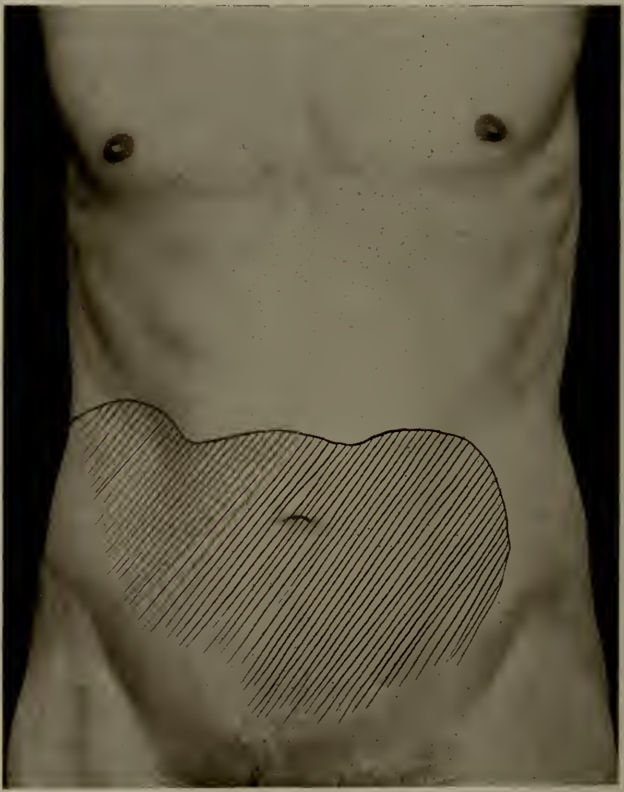

Fig. 195.—Shaded area represents dulness in an extensive case of encapsulated tuberculous peritonitis. Entire pelvis and lower abdomen filled with fluid, but walled off by agglutinated coils of intestine and omentum.

1. *Ascitic or Free Fluid Type* (Fig. 196).—It was formerly taught that all cases of tuberculous peritonitis began in a slow, insidious manner, but further experience has shown that about one-third of the cases have an acute onset. The symptoms in such patients resemble greatly those affections which are of non-tuberculous nature and which are usually included under the head of acute abdominal conditions. It is unnecessary for me to enumerate these, as I have discussed them in a previous lecture. In the cases of tuberculous peritonitis with acute onset there is a great resemblance to the ordinary pyogenic forms of infection. In addition to the history of an acute onset without predisposing

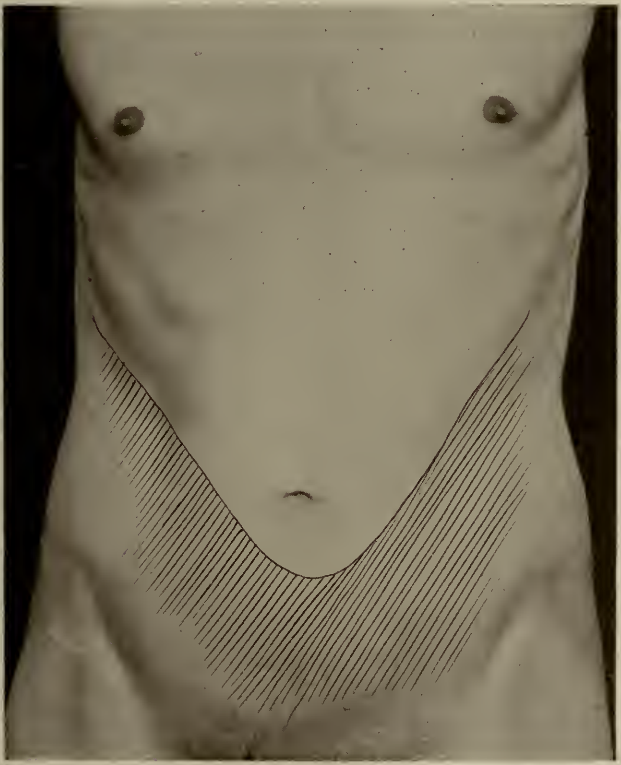

Fig. 196.—Shaded area of dulness in ascites when patient is lying on back. This area changes when patient assumes right or left lateral position.

symptoms, we find high temperature, high white blood count, and pain of a localized or more diffuse character. The pain when localized may be referred to the right iliac region or to the pelvis. In the former the primary focus in all probability has been of the ileocecal type, to which I have referred earlier in my lecture. In the pelvic forms we encounter cases of acute salpingitis of tuberculous origin which resemble greatly the ordinary non-tuberculous gonorrheal salpingitis. It is of interest in this connection to note that of 49 cases of tuberculous peritonitis observed in the clinic of Kümmel, 14 had an acute onset with high fever; of 10 cases of tuberculous salpingitis, 5 began with acute symptoms and high fever.

There is a second group which stands midway between the acute and chronic forms of tuberculous peritonitis, and we might give it the name subacute, because it begins in a little more insidious manner than the acute form to which I have just referred. I have observed such a case which had been treated for typhoid fever for four weeks before being seen in consultation. The onset had been gradual, accompanied by malaise, anorexia, gradually increasing stupor, tympanitic abdomen, and fever of a continuous type resembling in every respect that of a typical case of typhoid fever. Examination of the abdomen showed the presence of free fluid, and the Widal reaction being negative, we operated and found a very severe form of tuberculous peritonitis.

In introducing this subject of tuberculous peritonitis I have emphasized the fact that both from a pathologic and clinical standpoint it is at times impossible to definitely say that a case belongs in the free fluid, adhesive, or nodular type. It depends upon which one of the changes predominates and also upon the virulence of the tubercle bacillus; the more fluid, as a rule, the less adhesion, and vice versa. We can only distinguish the type of pathologic change clinically if one or the other of the characteristics of the various groups predominates. You must constantly be on your guard to avoid overlooking such a subacute or typhoid clinical form of tuberculous peritonitis as I have just described. At operation in this case we found free fluid and many adhesions, and again places where there was encapsulated purulent fluid and many nodular masses which had undergone caseation. I mention these operative findings particularly to show you that a sharp separation of the three types is impossible in some cases.

The clinical picture in the free fluid or ascitic cases which begin in a chronic manner is a very deceptive one, and one should always be suspicious of the possibility of tuberculosis, especially in young adults, where free fluid appears in the peritoneal cavity without many prodromal symptoms. In some cases there is slight discomfort or even pain in the abdomen, but the most striking features are the gradual loss in strength and weight, the pallor, and the fact that the patient notes an increase in the size of the abdomen while there is a more general emaciation. This paradox is one to be borne in mind in the examination of such cases. It will hardly be necessary for me to tell you how to detect the presence of free fluid (Fig. 194). The great difficulty at the bedside is that it is impossible to elicit the presence of free fluid until it has reached a fairly large amount. This is the reason why so many cases, especially in young people, are overlooked. Again, it has been frequently observed clinically that the fluid disappears spontaneously and then recurs, thus adding to the difficulties of diagnosis.

In the differential diagnosis of cases of free fluid in the abdomen we must take into consideration the following: (1) Cardiac decompensation; (2) portal thrombosis from any cause; (3) abscess of liver (if portal vein is compressed); (4) Banti's disease; (5) chronic pancreatitis, abscess, or cancer of pancreas; (6) cirrhosis of liver; (7) Pick's disease (cardiac pseudocirrhosis, polyserositis, or perihepatitis fibrosa); (8) cancer and lues of peritoneum; (9) non-tuberculous diffuse peritonitis (either exudative or adhesive).

It is not advisable to make an exploratory puncture if the diagnosis can be made in any other way. In connection with these cases of ascites do not overlook the frequently observed fact that cirrhosis of the liver is frequently accompanied by tuberculosis, and again, that hemorrhagic fluid means either tuberculosis or neoplasm. In differentiating between ascitic fluid and inflammatory exudate, the following points are of chief importance. Ascitic fluid, as a rule, does not contain more than $\frac{1}{2}$ or 1 per cent. albumin, its specific gravity is 1012 to 1014, and the microscopic findings are practically negative. In older cases, however, we can have a higher percentage of albumin, as high as 4 per cent., even without inflammatory disturbances. In inflammatory exudates there is usually from 4 to 6 per cent. albumin, the specific gravity is 1018 or more, and microscopically there is a predominance of lymphocytes and also a few endothelial cells. There are few polymorphonuclear leukocytes and no red blood-corpuscles as a rule, although, as I have just stated, if the fluid is hemorrhagic both to the naked eye and microscopically, we must always suspect tuberculosis or neoplasm. A hemorrhagic fluid in tuberculosis, however, is rather the exception than the rule.

At operation in these cases of tuberculous peritonitis with free fluid we find the peritoneum much thickened and reddened, and over its entire surface, both visceral and parietal, are scattered a great many miliary to hempseed-sized grayish nodules. In severe cases these nodules may be so large as to resemble a carcinosis of the peritoneum, and only microscopic examination of an excised nodule in the absence of finding a primary neoplasm will settle the diagnosis. As a rule the miliary nodules in carcinoma of the peritoneum are more whitish and more raised above the level of the serosa and larger than is the case in miliary tuberculosis. In late cases there are many adhesions between the coils of intestine and also a rolling up of the omentum. The free fluid is usually of a yellowish color, clear, and containing a few flocculi of fibrin, but, as I have just stated, the fluid may be hemorrhagic, and in 2 cases observed by Umber the fluid was observed at autopsy to be of a chylous character.

2. *The Encapsulated Form* (Figs. 193–195).—This form of tuberculous peritonitis resembles in many respects an abdominal tumor; especially is this true of encapsulated accumulations in the pelvis in the female, where the differential diagnosis from ovarian cyst becomes at times very difficult.

In these cases we may also have an acute onset (Figs. 193, 195). The fluid may be of a serous, hemorrhagic, or even of purulent character, and not infrequently a diagnosis is impossible before operation owing to the resemblance to other forms of abdominal tumor. At operation we find many coils of small intestine plastered together, with enlargement of the mesenteric lymph-nodes and a rolled-up condition of the omentum. Between the coils we find fluid and there may be one or more such encapsulated areas in the abdomen.

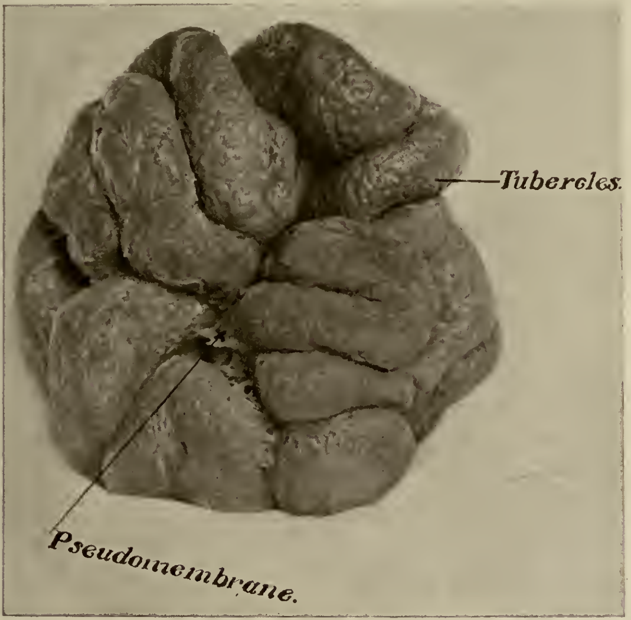

Fig. 197.—Coils of intestine in a case of tuberculous peritonitis. The label "pseudomembrane" leading to a cross shows how these false membranes bind the different coils of intestine to each other. The serous surfaces of the various coils show innumerable tubercles covered by this false membrane.

3. *Adhesive or Nodular Type.*—This type may be found in various stages, according to the virulence of the organisms. In the milder forms upon opening the abdomen we find the peritoneum uniformly studded with miliary tubercles, while in the more severe cases the agglutinated tubercles with extensive

caseation combine with the agglutinated coils of intestine (Fig. 197) and agglutinated adhesions of the omentum to form an almost inseparable mass.

The clinical picture in the dry or adhesive (nodular) form is, if anything, a more deceptive one than that of the ascitic or encapsulated forms. As I have said before, even in these cases there may be an acute onset. There is gradual loss of strength and weight with increasing distention of the abdomen without evidences of free or encapsulated fluid. Such a clinical picture should always make one suspicious of a possible tuberculous origin, and a careful search should be made for evidences of a primary extra- or intra-abdominal primary foci.

The **prognosis** of abdominal tuberculosis varies greatly with the severity of the original infection and whether or not it is possible to eliminate the primary focus. This is especially true of tuberculosis of the cecum and appendix and of the ileocecal mesenteric nodes, the tumor or stenosing type of small intestine tuberculosis, and of tuberculous salpingitis. The outlook in cases of tuberculous peritonitis with free exudate is very good following operation, but the same cannot be said for the other two forms. An interesting paper has appeared from the Clinic of Kümmel, by Kayser, in regard to the end-results in a series of 80 cases of various forms of abdominal tuberculosis as the result of operation. Of 23 cases of tuberculous peritonitis with free fluid, 10 died within the first year and 13 were alive and well at varying periods from one to thirteen years after operation. It is interesting to note that 1 case showed a recurrence after eleven years of apparently good health. Of 6 cases of encapsulated fluid, 1 died three weeks after operation, 1 could not be followed, and 4 were well at varying periods of from nine to thirteen years. Of 20 cases without exudate, 11 died within the first few months, 2 were in bad condition, and only 7 recovered. We thus see that the prognosis in the dry adhesive or nodular type is not as favorable as in the other two forms, and this is a matter of frequent clinical experience with all of us. Of 13 cases of ileocecal tuberculosis, 2 died immediately following operation; 1 after a month of unknown cause; only 5 remained permanently well. Of 3 cases of tuberculous appendicitis, only 1 was well a year after operation. Of 10 cases of tuberculosis of the tubes, 2 died of generalized tuberculosis within six months after operation, 1 could not be traced, and 7 were found well at intervals of from one and one-half to thirteen years. Altogether there were 48.1 per cent. of recoveries, of which 35.8 per cent. were found well from four and one-half to fourteen years after operation, so that they can be considered as cures. We thus see that although the prognosis is by no means as unfavorable as we have been led to think twenty years ago, yet it is a serious disease, and, unfortunately, all cases are not amenable to surgical interference or even non-operative treatment.

Treatment.—It is impossible in a clinical lecture devoted to the entire subject of abdominal tuberculosis to take up in detail the treatment of each variety, so I shall only attempt, as I have previously done, to give you a bird's-eye view of this portion of the subject.

Cases of tuberculosis of the appendix with primary involvement of the mesenteric lymph-nodes, which begin suddenly like an acute appendicitis, should be operated upon immediately. At the same time that the appendix is removed an effort should be made to excise as many as possible of the adjacent nodular involved mesenteric lymph-nodes, because cases of secondary tuberculous peritonitis may be avoided in this manner.

Ileocecal tuberculosis should be subjected to resection in preference to anastomosis if the former can be done. There are many cases, however, where the presence of dense adhesions and the advanced nature of the disease renders any surgical interference inadvisable.

There is some difference of opinion in regard to the treatment of tuberculous salpingitis. The majority of surgeons, however, believe that salpingectomy is indicated. Some, like Cerstens and myself, are not in favor of such a radical measure in every case, as it is best to conserve the tube for the purpose of future pregnancies, as has been done successfully.

The only form of tuberculous peritonitis in which operation is always indicated is the ascitic or free fluid form. The same is true of the encapsulated form, in fact, for the purpose of evacuating the fluid if it can be accurately localized.

If the dry or adhesive (nodular) form of tuberculous peritonitis should be operated upon through an error in diagnosis, it is inadvisable to attempt any separation of the adhesions or removal of the nodular masses.

The tumor-like form of intestinal tuberculosis is subject to the same treatment as the ileocecal form of tuberculosis, namely, resection if possible.

The primary forms of mesenteric node tuberculosis, whether of an acute or chronic form, are best treated by removal of all accessible nodes if this can be safely done. This is especially true of the ileocolic group of nodes, less so as one advances toward the root of the mesentery.

The general tendency in abdominal tuberculosis with the exception of the above instances has been toward conservatism following the excellent results obtained by Rollier, Bircher, Hinsdale, and others through the use of helio- and *x*-ray therapy. Tuberculin has been discarded as being dangerous both as a diagnostic and therapeutic measure.

It has been impossible in this clinical lecture to cover every phase of this vast subject, but I trust at least that I have caused you to think of abdominal tuberculosis as a whole, and not to labor under the former opinion that tuberculous peritonitis constituted practically the only form of abdominal tuberculosis.

CLINIC OF DR. GEORGE E. SHAMBAUGH

Presbyterian Hospital

MALIGNANT TUMOR AT THE UPPER END OF THE ESOPHAGUS

Summary: Diagnosis. Treatment largely palliative. Folly of tonsillectomy in absence of proper indications.

This woman is sixty-two years of age. She consulted me for the first time on October 28, 1919.

The one symptom which was causing annoyance was difficulty in swallowing. This she had noticed since May, 1919. She had very little complaint about discomfort or pain. Five weeks previous to seeing me she had had her tonsils removed. The patient appeared weak and stated that she had undergone decided loss in weight since last May.

Nasal conditions were found to be normal. The epipharynx and the oropharynx were normal. On depressing the tongue nothing abnormal was detected in the hypopharynx. By means of the laryngeal mirror it was possible to exclude any laryngeal involvement. Vocal cords were normal and their action was unimpaired. Just back of the larynx, at the beginning of the esophagus, one recognized, by means of the laryngeal mirror, an irregular mass, projecting upward. This was located more toward the left side. The surface of the mass was somewhat irregular, with no distinct inflammatory reaction involving the mucous membrane, and no evidence of ulceration. When the patient inspired deeply, so as to dilate the rima glottis, the upper end of the tumor tended to drop over between the arytenoid cartilages. On phonation the tumor receded again into the hypopharynx and the cords approximated normally.

A cancer in this locality is not very uncommon. One can usually recognize the presence of the condition by the use of the laryngeal mirror. Even in cases where the tumor does not project into the hypopharynx an edematous swelling of the mucous membrane just back of the larynx, at the beginning of the esophagus, appears rather early. Operative treatment directed for the removal of the tumor is not very satisfactory for obvious reasons. Its removal is rather difficult without at the same time removing the larynx, and palliative measures, such as gastric fistula, for feeding purposes, is often all that one seems justified in carrying out.

This case illustrates a situation which is all too common at present. It is the tendency to blame all sorts of conditions upon tonsils. The fact that chronic infection of the tonsil is now recognized as a distinct menace and as the cause for various types of systemic infection, seems to have brought about rather a hazy conception in the minds of many practitioners as to the conditions which can be reasonably blamed upon tonsil infection. The indiscriminate removal of the faucial tonsils is deprecated by everyone who is interested in nose and throat work, and the question as to whether the tonsils require removal in a particular case frequently calls for very careful discrimination. It is a mistake to teach practitioners of medicine the technic of operating on the tonsils without teaching them first the more difficult problems in diagnosing those conditions which justify a tonsil operation. There is nothing in this patient's symptoms which suggested any tonsil trouble. Her one annoyance was difficulty in swallowing. The only tonsil trouble which would bring out this symptom is an acute infection, such as an acute follicular tonsillitis, a peritonsillar abscess, or a malignant tumor of the tonsils. None of these conditions had been present in this case. Apparently the tonsils were removed on the principle that where one discovers no palpable evidence of other trouble, take out the tonsils. It is very evident that this is a wrong principle. Such a view naturally brings suspicion on the question of tonsil operations, just as the indiscriminate removal of the ovaries previously practised by gynecologists brought into suspicion much of the work which was being done by these surgeons.

ENCEPHALITIS WITH PARALYSIS OF SOFT PALATE AND ESOPHAGUS

Summary: Diagnosis—differentiation from postpharyngeal abscess. Nasal feeding—precautions to be observed.

This boy, aged seven years, was brought to the Presbyterian Hospital October 5, 1919 with a diagnosis of postpharyngeal abscess, which had been made because of the symptom of difficult swallowing associated with the accumulation of mucus in the pharynx, which the patient had difficulty in expectorating.

The patient's illness had come on rather suddenly three days before, when he was found to have a temperature of 102° F. and was unable to swallow. He complained of headache. There seemed to be a little stiffness of the neck, at least movement of the head caused some discomfort. The following day the physician in charge thought that the symptom of secretion in the throat was more marked and that there was an odor to the breath which resembled that from pus. The following day the patient began to be more or less somnolent, still complained of headache, and was not able to swallow.

The patient was then brought to the Presbyterian Hospital. I was expecting, from his symptoms, to find some palpable evidence of obstruction in the hypopharynx. The boy was lying quite still, with his eyes closed, apparently half asleep. When addressed sharply he could be aroused enough to make an intelligent reply, stating his age and where he lived. His voice had the characteristic sound caused by paralysis of the soft palate, such as we meet with in postdiphtherial paralysis. When bringing the patient to the hospital he had experienced several choking attacks, due to difficulty in clearing the accumulation of mucus from the larynx.

Examination disclosed no evidence of infection or infiltration in any part of the pharynx. By means of the laryngeal mirror the larynx was found obscured by an accumulation of ropy mucus. That there was no involvement of the vocal cords themselves was apparent, even though inspection of the cords was obscured by the accumulation of mucus. In the first place, the patient experienced no difficulty in breathing, except at times when there was an excessive accumulation of mucus, and in the second place, there was no element of hoarseness in the voice which could be attributed to laryngeal involvement. I did not feel that we were able to exclude the possibility of a foreign body lodging in the upper part of the esophagus causing the difficulty in swallowing, the accumulation of secretion, and giving rise to the elevation in temperature.

The skiagraph disclosed no evidence of any foreign body and no disease of the cervical vertebræ. Examination of the spinal fluid showed that there was increased pressure, not such, however, as one finds associated with epidemic cerebrospinal meningitis. There was a decided increase in the cell count. The fluid was sterile. There was a slightly developed Kernig. The head was thrown back slightly, but there was no very marked rigidity. The Wassermann made on the spinal fluid was negative. Examination of the blood showed a moderately increased white count, varying from 12,000 to 24,000. The temperature for the first two weeks ranged from 99° to 101° F. After that it gradually subsided and became normal in a few weeks. When his symptoms were the most marked he was examined by Dr. Bassoe, who reports the neurologic findings as follows: "Moves eyes in all directions and shuts them firmly; tongue protruded well and raises soft palate a little; deep reflexes absent; bilateral Babinski; abdominal reflexes present, but weak; slight Kernig sign; flexion of neck resisted; speech unintelligible, thick; can be aroused, but drops to sleep again." The condition was evidently one of encephalitis, with paralysis of the soft palate and the esophagus. Since the patient was not able to swallow, feeding was carried on by means of a nasal tube, that is, a soft-rubber catheter was passed through the nose until it had passed the opening of the larynx. This position was ascertained by placing the tip of the tube in a tumbler of water, when, on expiring, if the tube was in the larynx, air would cause bubbling. This precaution had to be observed so as not to take any risk of throwing the food into the trachea. Proper nourishment could be administered in this way. It was several weeks before the patient was able to take nourishment by the mouth. When the patient left the hospital he was feeling very well and the only symptom which persisted was impairment of the voice resulting from the persisting paralysis of the soft palate.

NASAL OBSTRUCTION SIMULATING PERSISTING HEAD COLDS

Summary: A child presenting a history of frequent sneezing attacks associated with an abundant secretion of thin mucus from the nose. Diagnosis. Unnecessary operations and the half-baked specialist.

This child was brought to me in 1913, when he was two and a half years old, with history of symptoms of continuous nasal obstruction, which dated practically from birth. There was a great deal of watery mucous discharge from the nose and frequent sneezing attacks. There was no history of attacks of tonsillitis, nor were there any ear symptoms.

Examination disclosed normal drum membranes. The tonsils were small and there was no evidence of chronic infection. There was no enlargement of pharyngeal tonsils. The nasal passages were quite small. The middle turbinate body, on either side, was wedged in tightly between the septum and the outer wall of the nose, a condition with which we meet not infrequently in adults, especially in cases where the patient is troubled by the symptoms complained of here: sneezing attacks, increased nasal secretions, and nasal obstruction, simulating very closely the reaction associated with hay-fever, but differing from the latter in the fact that the symptoms persist throughout the year and may even be more troublesome in winter than in summer.

I am reporting the case because it illustrates the situation too frequently met with in these days, when there is no regulation regarding requirements for entrance into the practice of specialties. The child is still having the same type of symptoms as when I first saw him, and examination of the nose still discloses the same anatomic situation, resulting in obstructed ventilation of the ethmoid. One interesting feature about this case is that the child has been subjected to two operations on the adenoids and one on the tonsils since I first saw him, although there has never been any history of tonsillitis or any symptoms suggesting trouble from this source.

The condition that presents itself in the child's nose is one which in adults we can very often relieve by resection of the middle turbinate bodies. I do not believe, however, that such an operation in the nose should be undertaken in children where there is no evidence of pus infection. When the child gets a little older, if symptoms are still persisting, one may be able to carry out this procedure under local anesthesia.

ASTHMA CURED BY OPERATION IN NOSE

Summary: Demonstration of patient four years after exenteration of ethmoid because of recurrent head colds and asthma. Primary diagnosis, method of treatment, and results to date.

THE case is that of a man, aged thirty-nine, who consulted me first in February, 1916, complaining of frequent attacks of acute head cold, nasal obstruction involving both sides, sneezing attacks associated with profuse watery discharge from nose, and severe paroxysms of asthma. The head colds and the alternating nasal obstruction he dated back at least five years. The asthma followed acute infection, which he contracted August 14, 1914. At that time he had a chill, followed by a temperature of 104° F. Four or five days later he developed coughing and asthma. He states it was five or six weeks before fever entirely disappeared, and up to the time he saw me in 1916 he had more or less continuous asthma, with severe exacerbations, except for short periods when in Arizona. So severe were the paroxysms that he was often obliged to sit up an entire night.

On examining his nose I found that the septum was irregular, deflected in front to the left, and above and behind this to the right. On both sides inspection of the ethmoid was difficult, even under cocain. On the left side it was possible to recognize small polypi appearing under the free edge of the middle turbinate body. The situation here was one of hyperplastic ethmoiditis, a condition frequently found associated with symptoms which are commonly called reflex, such as sneezing attacks and asthma.

It was not possible to operate on the ethmoid without first correcting the nasal septum. The operation was undertaken four days after first seeing him. The nasal passages were cocainized by carefully placing along both sides of the septum thin pledgets of cotton which had been saturated with a solution of 5 per cent. cocain made up in 1:1000 adrenalin. Care was taken to cocainize the ethmoid region as thoroughly as possible by pushing small pledgets of cotton saturated with cocain against the free edge of the middle turbinate body. The operation was carried out with the patient lying down on the operating table, with the head elevated. We find this much preferable to a sitting position, especially for such operations as submucous resections of the septum, which often require considerable time. In this case after correcting the septum we had no difficulty in getting a satisfactory view of the ethmoid region;, and the usual operation for exenteration of the ethmoid was carried out. This means, first of all, the resection of the middle turbinate body. We find this most readily accomplished by the Andrews knife, which cuts through the anterior part of its attachment. A wire snare is then passed over the partially detached portion and the turbinate body is pulled away from its attachment. With this accomplished it was but the work of a few seconds to complete the exenteration of the ethmoid labyrinth by using suitable nasal forceps. We were able in this case to carry this out for both sides of the nose. The ethmoid was found filled with mucous polypi.

Almost immediately after operation the patient experienced a return of the sense of smell, of which he had been deprived for some time.

When he was seen by me in September, 1916 he reported his condition as very much improved. Since that time there has been no return of asthma, and examination of the nose shows that the ethmoid region has remained free from polypi.

PERSISTENT MASTOID FISTULA AFTER SIMPLE MASTOID EXENTERATION

Summary: Cause of persistent postoperative mastoid fistulæ. Diagnosis. Method of closure.

This patient consulted me October, 1919. She was a woman twenty-four years of age, who had undergone a bilateral mastoid operation, which had been undertaken four days after the onset of an acute otitis media.

It was evident from the size of the scar that rather an extensive exenteration was carried out. On the left side the scar over the mastoid is depressed and the opening into the antrum is closed by a very thin delicate membrane. This membrane is so delicate that there is a slight superficial erosion going on over the outer layer, but there is no opening into the antrum. On the right side there is presented a depressed scar in the mastoid opening and a fistula fully $\frac{1}{2}$ inch in diameter opening directly into the antrum. There is no active discharge, but the patient was very much annoyed and worried over the condition of both ears, and had the impression that further mastoid operations would have to be undertaken before the disease in the mastoid would be eradicated. The drum membrane on both sides is practically normal and the hearing for the whispered voice was normal in both ears.

The persistence of a postauricular fistula after the completion of a radical mastoid operation is not uncommon in cases where the situation uncovered at the time of the operation did not permit of a primary closure of the incision over the mastoid, and where the dressings were carried out over a long period by introducing the gauze through the mastoid opening. It is much less common to meet with the persistence of a mastoid opening after a simple mastoid exenteration such as one carries out for the relief of mastoiditis developing in connection with acute otitis media. I have never had this experience in any case which I have operated

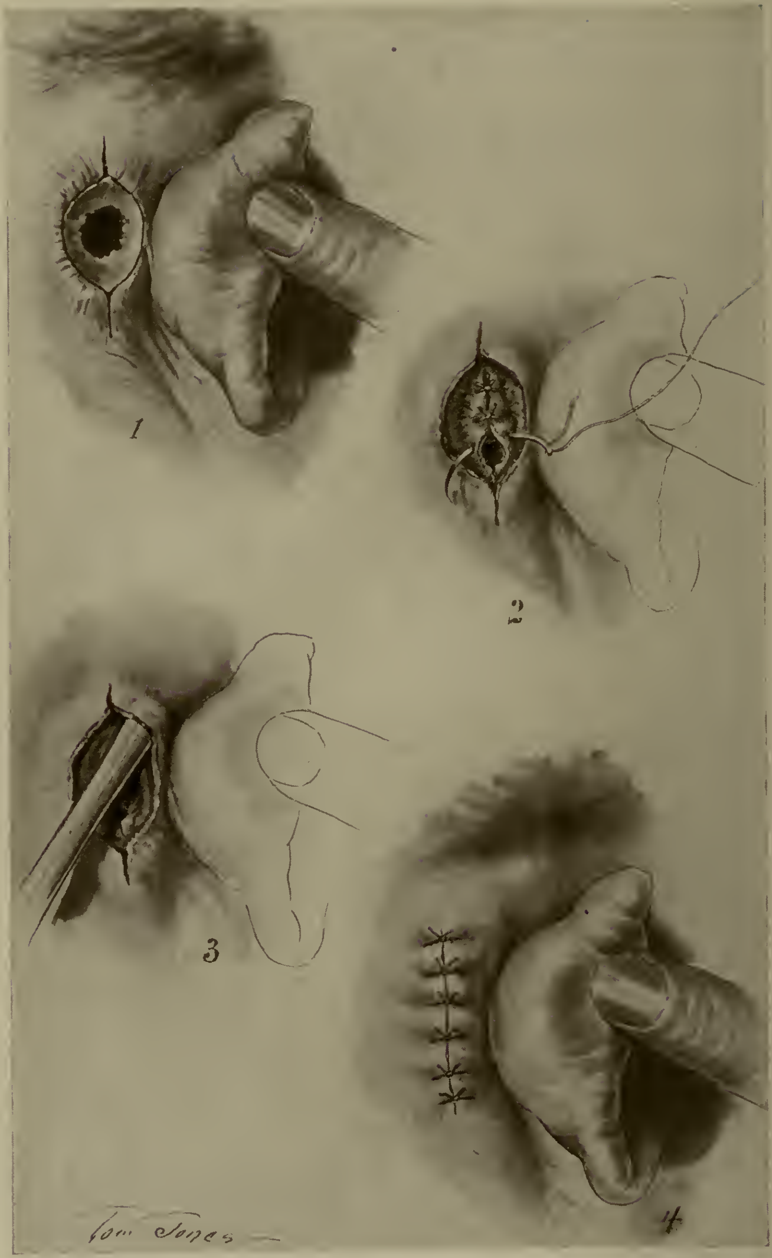

Fig. 198.—Technic of closure of persistent mastoid fistula.

on myself, but I have observed it several times in patients who had been operated elsewhere. It has been my impression that the chief factor in developing the permanent fistula has been too persistent packing of the mastoid opening. The simple mastoid operation as we do it now makes a closure of the incision over the mastoid with the exception of only a small place, which is left more for drainage than for packing. The persistence of an open fistula after a simple mastoid operation is often misinterpreted as signifying some deep-seated involvement of the bone, which is keeping the fistula open. I have seen this mistake made in several cases where the impression of the existence of carious bone was emphasized by the surgeon introducing the probe and discovering what he thought was a sensation of roughened bone. As a matter of fact, this sensation can be produced by introducing the probe in any of these cases where there is a persisting opening, the reason being that the covering of the bone in the antrum is but a very delicate, thin membrane. The persistence of a diseased bone can be recognized by the persistence of a purulent discharge from the ear. A mucous discharge which is not purulent is not characteristic of a disease of the underlying bone, but means rather the continuation of a catarrhal condition in the antrum, aditus, and tympanum.

The treatment for the closure of a persisting mastoid fistula, whether this occurs as a sequel of a radical or a simple mastoid operation, is the same. Under either a local or general anesthesia a spindle-shaped incision is made somewhat within the outer rim of the depression (Fig. 198, 1). The membrane covering the deeper part of the mastoid opening is then dissected free, so that it can be turned in and sutured, bringing the outer surface on the inner side (Fig. 198, 2). The skin external to the primary incision is then elevated sufficiently to permit of a coaptation of the opening (Fig. 198, 3, 4). In this way two layers cover the opening, and I have never had any difficulty in securing a permanent closure by this simple method.

ACUTE OTITIS MEDIA IN AN INFANT WITH ACUTE SWELLING BACK OF THE EAR

Summary: Diagnosis and treatment. Pathologic anatomy of postaural swellings in infants with otitis media—the two types—indications in each—precautions to be observed in operative procedures.

In December, 1919 a child six months old was brought to me because the mother had discovered that morning the development of a swelling back of the right ear. The mother did not think the child was ill, but, on making inquiry, she stated that she had noticed the baby had been more fretful than usual for perhaps a week. She was beginning to suspect that there might be some trouble in the ears because she had noticed the child had developed a tendency to bore in the ear with its fist. She had not taken the temperature, but for several days had noticed the child at times felt feverish. The patient did not present the appearance of being very ill.

Back of the right ear was found a distinct infiltration with congestion of the skin. The infiltration caused the auricle to stand out perceptibly from the side of the head. The picture was that characteristic of periostitis developed in the course of acute mastoiditis.

An examination of the ears disclosed that there was acute otitis media in both ears. Both drum membranes were bulging very perceptibly. The appearance of the drum membranes was somewhat different from what one often sees in these acute cases. The membrane had a whitish or yellowish color for the most part, instead of the bright red color which is so characteristic of the membrana tympani in cases of acute otitis media. The landmarks were obscured. The processus brevis and handle of the hammer were faintly discernible. The peculiar yellowish color of the drum membrane was due to an accumulation of pus in the tympanic cavity. The temperature was 102° F.

Both drum membranes were incised by making a cut along the posterior border of the handle of the hammer, far enough away so as not to run the risk of cutting into this bone. This incision was carried to the floor of the tympanum. A distinctly purulent secretion protruded into the opening.

The only further treatment instituted was regular cleansing of the canal three times a day with dry pledgets of cotton, and the placing into the canal of a wick-like tuft of cotton, which was changed whenever it became moist. Within three days the temperature had dropped to normal and the swelling back of the ear had entirely disappeared.

The case illustrates a not uncommon occurrence, especially in children under one year of age, where the development of periostitis back of the ear is not due to any softening of the bone, but is caused by the extension of infection through the petrosquamosal suture, which passes directly through the outer wall of the antrum. There is no mastoid process in an infant at birth and, of course, no mastoid cells. The middle ear consists of the tympanic cavity, the aditus, and the antrum; in reality, two large chambers with only a slightly constricted communicating passage—the aditus.

In cases of acute otitis media where there is not prompt drainage through perforation of the drum membrane, it happens very readily that the infection from the antrum extends to the periosteum over the mastoid region by means of the blood-vessel and lymphatic communications, which pass through the patulous petrosquamosal suture.

The significance of a reaction back of the ear, therefore, which occurs in a young child before the drum membrane ruptures is not the same as where this reaction develops after the ear has been discharging for a week or more. The latter condition usually indicates extension to the periosteum by softening of the outer wall of the antrum.

The operative treatment for the two conditions is also quite different. In the first place, where periostitis develops before rupture of the drum membrane, in the majority of instances this will subside promptly after the drainage through the drum membrane has been established. In those cases where this periostitis goes on to the formation of a subperiosteal abscess, the simple Wild's incision, that is, an incision parallel with the attachment of the auricle over the swollen region, cutting through the periosteum, is all that is necessary to bring about prompt cure, since there is no disease of the bone, but only an extension of the infection from the antrum through the patulous petrosquamosal suture to the periosteum. The other type of case, that is, where the periostitis back of the ear develops some time after the discharge through the drum membrane has been established, requires something more than Wilde's incision. In these cases, as well as in some of the cases where periostitis develops before the drainage from the tympanum has been established, the subperiosteal abscess is dependent upon the extension of infection by softening of the bone covering the outer wall of the antrum. A simple Wilde's incision is not sufficient in these cases. It is necessary to remove the diseased bone with a curet. This operation is simple as compared with the operation for an acute mastoiditis occurring in an adult. However, the chances of doing harm by operation are as great as in the adult. In the first place, the absence of a mastoid process leaves the opening through which the facial nerve escapes exposed over the surface of the bone back of the ear. In making a simple incision through the periosteum it is a very simple matter to cut the facial nerve. In the second place, when attempting to remove the softened bone by means of a curet it is important that one recognize the different anatomic relations existing in an infant from those found in the adult, otherwise the operation may very easily result in injury to important anatomic structures, such as the horizontal semicircular canal, the lateral sinus, and the facial nerve, where this courses through the temporal bone.

CLINIC OF DR. GATEWOOD

Presbyterian Hospital

TUBERCULOUS GLANDS OF THE NECK

Summary: Etiology and surgical pathology of tuberculous cervical lymphadenitis. Frequency of infection by tubercle bacilli of the bovine type—remarkable coincidence of decrease in number of cases of tuberculous glands of neck with improvement in milk-supply. Treatment—radical operation becoming obsolete—good hygiene, removal of possible primary foci in mouth and throat, local evacuation of cold abscesses and *x*-ray the present methods of cure.

This patient is a maid in the hospital. She is twenty-three years old and gives the following history: She has always been well until about three or four months ago when she noticed a swelling on the right side of her neck. This was not painful. It gradually increased in size. At first it was hard, but it eventually softened and was opened by a physician, allowing a considerable quantity of yellowish pus to escape. Following this the lesion healed almost by primary union. She now returns with two discrete swellings in the neck. The upper one lies immediately beneath the scar of the former incision and distinctly gives a sense of fluctuation. The second one is located about 3 cm. below the first and is quite firm. It can be readily moved and is not adherent to the skin (Fig. 199). Its location is that of a deep cervical gland. There is no redness of the overlying skin. Examination of the throat shows that her tonsils have been removed. There is no evidence of infection in the mouth, nose, or ears. There are no palpable glands on the left side of the neck or other swellings on the right side. Her general condition is excellent. She has had no elevation of temperature during the short period we have had her under observation, and the internists state that they have been unable to find any evidence of pulmonary disease. In spite of these facts, she almost surely has tuberculous glands of the neck, and it is with that diagnosis we are operating.

Under gas anesthesia, I am making an incision parallel to the anterior border of the sternomastoid muscle, dissecting out the old scar. I have opened into an abscess cavity which contains about 2 drams of creamy pus. There are some flocculi in this pus, making the diagnosis of tuberculosis more certain. I can find but a single large gland below this abscess. Extending my incision downward, I am removing this firm smooth gland about which there is very little periadenitis. What shall we do with the cavity? There are two procedures to be considered. The first, which has been standard for many years, is to curet out all diseased tissue and pack with iodoform gauze. Some time ago Kausch[1] recommended the injection of iodoform and

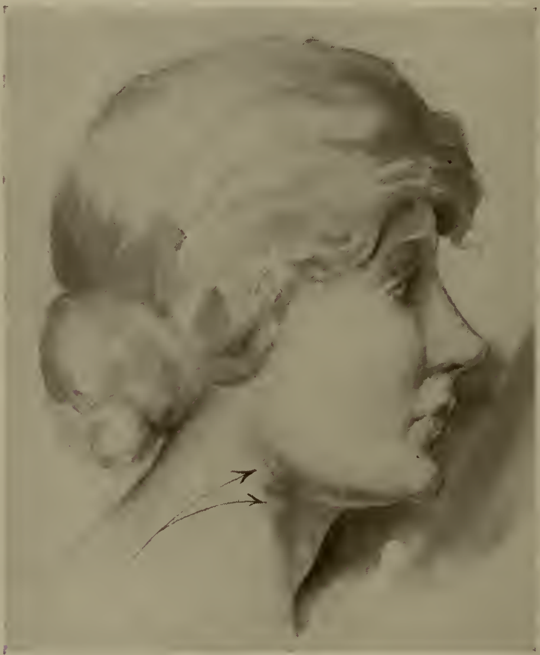

Fig. 199.—Small tuberculous glands of neck.

glycerin emulsion and closure of the wound. By this method primary union is obtained in many instances. More recently some surgeons have been treating selected cases in the same manner as contaminated wounds, dissecting out, when possible, the entire infected area and closing immediately. That is what I shall endeavor to do in this case. In addition, I am swabbing out the entire field with iodoform emulsion, not so much for its antiseptic properties, as for its stimulating action upon the tissues. It is important, I think, to have perfect hemostasis and to close the wound accurately in order to eliminate all dead space. We shall probably obtain primary union, but should infection occur, we have lost nothing.

This is an example of the type of tuberculous glands of the neck which we frequently see today. A number of just such cases may be seen in our dispensary almost any day. Most of them occur in patients somewhat younger than the one upon whom I have just operated, and though tuberculous lymphadenitis is primarily a disease of childhood and adolescence, it may appear at any age. The Boston Board of Health found 13,711 cases of enlarged glands of the neck in examining 118,781 school children (11.6 per cent.). Others have found them in a much larger percentage of children. This naturally does not mean that all young patients with chronically enlarged glands have tuberculosis, although it must always be considered as a possibility. Hawes,[2] in reviewing the treatment of tuberculous glands of the neck as carried out at the Massachusetts General Hospital, states that he believes that any chronic adenitis of more than three months' duration should be considered as tuberculous and treated as such. The development of the disease may be rapid or slow, depending upon the susceptibility of the individual and the extent of the pulmonary involvement already present. The infection may begin at either end of the chain, though by far the greatest number appear first in the submaxillary region. G. B. Wood[3] pointed out that the tonsils drain into the superior cervical glands, especially into the one lying under the anterior border of the sternomastoid, just behind the angle of the mandible. Much light has been thrown upon the method of invasion of the cervical glands by experimental work upon animals. It has been shown repeatedly that the epithelium of the tonsil may be penetrated by tubercle bacilli without leaving any marks or evidence of such invasion. Wood, in his experiments upon hogs, found that tubercle bacilli inoculated on the surface of the tonsil were carried into the gland and that on the fifth day they could be demonstrated in the "tonsillar lymph-gland" in the neck. Cornet in 1914 fed large quantities of infectious material to various animals and found that the cervical glands became infected in almost every case through the mucous membrane of the tonsil. Griffith fed 92 animals, and found tuberculosis in the tonsils in 23 instances, while the cervical glands were involved in 50 of his animals. While there can be no doubt that the tonsil is one of the most important portals of infection for the development of tuberculous cervical lymphadenitis, other sources, such as infections of the teeth, tongue, and salivary glands, must be thought of in considering the treatment.

Although the type of organism makes but little difference in the course of this disease, of interest is the fact that the bovine type predominates in children, while the human variety is much more frequent in adults. A. S. Griffith[4] made a careful bacteriologic study of cervical and axillary tuberculous lymph-nodes in 52 patients. He found that in children under ten years of age 72 per cent. of the infections were of the bovine type; between the ages of ten and twenty one-third were of the bovine type; of infections developing in patients over twenty years of age only one-fifth were of the bovine type.

In cases which have broken down with the development of abscesses there is apt to be a secondary infection due to the staphylococcus. It is in the attempt to avoid this complication that I have operated upon this patient, though there are surgeons today who maintain that these cases should be allowed to open spontaneously, because even broken-down glands occasionally are absorbed without going on to sinus formation.

In this case with a cold abscess and a chronic inflammatory process there has been no difficulty in making a diagnosis, as there is little else to consider. Ofttimes, however, one must think of other chronic enlargements due to pus organisms as well as syphilis, leukemia, and malignancies.

Chronic non-tuberculous adenitis is frequently found following acute tonsillitis and as a result of otitis media and other infections about the head, especially those due to pediculosis capitis. In the early stage I know of no absolute method of differentiating them clinically and only time will settle the diagnosis. Both are non-adherent to the skin and both are discrete. There is no doubt that many non-tuberculous glands do become tuberculous later on. The treatment is the same in both cases, that is, to remove all possible sources of infection and give the patient the benefit of the best hygienic surroundings. The non-tuberculous glands will usually rapidly decrease in size under this management, although small, hard nodules are apt to persist for a long time.

Syphilis rarely offers great difficulty in differentiation, as the glandular involvement is either a part of the general adenopathy of a secondary lues or of the acute adenitis of an extragenital chancre. Careful physical examination will usually render the diagnosis easy.

Enlarged cervical glands as a part of the picture of leukemia are not uncommon. The picture of generalized adenopathy, with freely movable glands and the characteristic blood findings, excludes tuberculosis very readily except in the conceivable cases in which both might be present simultaneously.

Of the malignancies, Hodgkin's disease is the most frequent perhaps and the most difficult to differentiate, especially in that variety beginning in the neck and not showing general adenopathy for a considerable time. The blood-picture, though suggestive, is not characteristic enough in either case to be of determining value. In Hodgkin's disease the glands do not break down, but remain discrete, while in hyperplastic tuberculous adenitis the glands may remain firm, discrete, and fairly movable for a long time. In such cases the microscope must make the final diagnosis. While pathologists are trying to differentiate between Hodgkin's disease and lymphosarcoma, we shall pass on to other malignancies, since clinically we are unable to separate them.

The picture in metastatic carcinoma of the cervical glands has little in common with tuberculosis. The presence of a primary tumor of the tongue, palate, or lip makes the diagnosis self-evident. The frozen-in sensation upon palpation is usually so definite that it is difficult to mistake it for anything else, although I have seen a case of primary carcinoma of the nasopharynx occurring in a man twenty-three years old, who was operated upon twice with the mistaken diagnosis of tuberculous cervical adenitis. The small primary tumor was not discovered until some months later. In case any doubt exists one should never hesitate to remove the gland under local anesthesia and to make a careful microscopic diagnosis before undertaking any radical surgical procedure.

Treatment.—The treatment of tuberculous cervical lymphadenitis depends upon many factors, although there are some fundamental principles which are common to the management of all cases. If asked as to the relative value of the various therapeutic measures I should put them in the following order: 1. The first, and by far the most important, is general hygiene. Although some of the patients we see seem to be in the best of health otherwise, the establishment of regular sleeping hours, increasing the out-of-doors hours, and the employment of heliotherapy will often mark the beginning of rapid and permanent improvement. Regardless of what other measures may be employed, hygienic measures must be considered of prime importance and other means merely as adjuncts. In addition to proper diet, climate, rest, etc., attention must be given in certain cases to proper occupations.

Of foremost importance in the diet is the question of the milk-supply. Most of the milk now used in the cities and larger towns is pasteurized. Griffith's work demonstrated conclusively that in England and Scotland at least a great majority of the cases in children were of the bovine type. In discussing the matter recently with Dr. C. H. Mayo, he told me that from a certain district in Wisconsin many cases of tuberculous cervical lymphadenitis formerly came to their clinic. Since the testing of cattle has become so general they have not had a single case from that particular district, although the number of surgical cases coming from that locality is on the increase.

2. Next in importance, although usually the first measure in point of time, is the removal of all possible sources of infection, such as bad teeth, bad tonsils, and nose infections. This is important not only from the standpoint of preventing further tuberculosis but also in avoiding secondary involvements in already infected glands.

3. Operative measures probably come third in order of importance, although some of my *x*-ray colleagues may disagree with me in this. I have not seen a radical resection of glands of the neck for tuberculosis in two or three years, but I can recall the time only a few years ago when there was scarcely a day but some surgeon in this hospital was doing a radical operation for this condition. The reasons for the change are several. In the first place we do not see anything like the number of cases we formerly did of great bilateral swellings in the neck. Then, those cases we do see are usually of the type I have shown you this morning, that is, with only a few glands involved on one or both sides. Part of this may be laid to the massacre of the tonsils and part to improved general hygienic conditions. I think, however, the most important single factor is the difference in the milk-supply.

Medical men gradually came to feel that tuberculous lymphadenitis in children should be treated conservatively because so many got well without operation, or by merely opening the abscesses when present. This treatment finally has been amplified to include adults as well, so that now a fairly rational basis for operation has been established.

Indications for operation should depend, then, upon the degree of infection and its duration, the size of the glands involved, whether or not they are broken down, and upon the surgical skill available. The financial condition of the patient must also be considered, as operation is advisable in some cases where prolonged treatment would be a financial hardship. In such instances, especially where one can be reasonably certain that the patient will not carry out any medical management advised, operation is resorted to in the hope that after a definite proportion of the patient's tuberculosis has been removed, his resistance will be sufficient to overcome the remaining foci. For example, let the patient's resistance arbitrarily be placed at 70 points, his pulmonary lesion at 50 points, and his neck lesion at 30 points. Removal of three-eighths of his infection would permit his resistance (70 points) to overcome the remaining infection (50 points).

The time for operation is always a difficult question to decide, although I believe that in general fluctuating abscesses should be treated either as we have done this morning, or where this is not feasible, by drainage under local anesthesia. All caseating glands should be removed if they do not react promptly to other measures, although this operation is rarely necessary. One must always remember that generalized tuberculosis is apt to follow such an operation, and death from acute pulmonary tuberculosis is not rare despite relatively few lung findings prior to operation. Out of 692 operative cases observed in the Berne Hospital, 29 per cent. eventually showed the disease in the lungs, intestines, kidneys, or meninges. Any extensive operation of this sort demands a good operator, although too often delegated to some inexperienced member of the house staff.

The anesthetic of choice is novocain, but its use is, unfortunately, out of the question in cases of extensive involvement. Where gas can be used, as in the present case, it is to be preferred as a general anesthetic. When a long radical operation is undertaken, ether has usually been employed, but as pulmonary complications are quite apt to follow its use, the amount should be reduced to a minimum by a good anesthetist and a good operator.

4. As a fourth therapeutic means at our disposal, and one whose value has been frequently overlooked, we have the *x*-ray. Russell H. Boggs[5] reported 500 cases, nearly all of which were cured by this means, and he thinks that over 90 per cent. may be cured if properly treated. Bonine says that surgical treatment is contraindicated in every case. The *x*-ray acts by cirrhosing the glands, going on to entire obliteration of the adenoid

tissue, although it can leave behind small, hard, and frequently calcifying nodules. I have seen roentgenography used in a number of cases in which the glands were large and hard, with very satisfactory results. My limited experience with broken-down glands treated with the *x*-ray would not warrant me in advising it until after operative measures had been carried out.

5. Lastly, I may mention tuberculin. I have used it in but a few cases, and have never been much impressed with its value as a therapeutic measure in this type of infection. Hawes employed it in 500 cases at the Massachusetts General Hospital, and seemed to think that in certain cases it was of decided benefit, but he was by no means enthusiastic in its support. While I am aware that some men are still strongly advocating its use, I believe that the use of tuberculin in lymphadenitis cases will eventually be discontinued.

In this brief sketch of the treatment as I see it today I have not considered any medicinal agents, such as iodin or some of its salts, which had quite a vogue at one time. By placing more emphasis on the early removal of all possible sources of infection, both focal and environmental, and by the institution of proper hygienic measures, including the use of the proper sort of milk, tuberculous lymphadenitis will gradually cease to be a surgical disease, just as the radical operation is rapidly becoming obsolete. In the meantime I feel that we should give careful individual consideration to each case before determining which of the therapeutic measures I have outlined should be employed.

BIBLIOGRAPHY

1. Kausch: Therap. d. Gegenwart, Berlin, li, p. 111.
2. Hawes, J. B.: Lumps in the Neck with Special Reference to Tuberculous Cervical Adenitis, Interstate Med. Jour., 1917, xxiv, 259.
3. Metcalf, W. B.: The Tonsils as a Portal of Entry in Tuberculosis of the Cervical Glands, Jour. Ophth. and Oto.-Laryngol., 1917, xi, 71.
4. Griffith, A. S.: Types of Tubercle Bacilli in Cervical and Axillary Gland Tuberculosis, The Lancet, London, 1917, 1, 216.
5. Boggs, R. H.: Tuberculous Adenitis and its Treatment by Roentgenotherapy, Amer. Jour. Roentgenol., 1918, v, 425.

CONTRIBUTION BY DR. ROY L. MOODIE

Department of Anatomy, University of Illinois, College of Medicine

THE ANTIQUITY OF POTT'S DISEASE AND OTHER SPINAL LESIONS; PRIMITIVE TREATMENT

Summary: Origin of tuberculosis unknown. Pott's disease first indicated in a Neolithic (5000 B. C.) skeleton from Heidelberg, where it attacked the upper dorsal vertebræ. The first psoas abscess associated with necrosis of lumbar vertebræ seen in the mummy of an ancient Egyptian priest (XXIst Dynasty, 1000 B. C.). Skoliosis in the skeleton of a fourteen-year-old girl from Weimar (500 B. C.) suggests Pott's disease. Other suggestive lesions are seen in two lumbar series of Pre-Columbian Indians of North America. Primitive orthopedic treatment among early peoples is suggested by a bark corset with eyelets for lacing.

The antiquity of tuberculosis, at least in one of its phases, is indicated by the condition seen in ancient skeletons and mummies dating from about 5000 B. C. to the present time. Of the ultimate origin of this dread disease paleopathology tells us nothing, although tuberculosis has been diagnosed as the cause of certain lesions among fossil tertiary mammals. Tuberculous conditions of the spine, vertebral caries, or Pott's disease are frequently and necessarily confused with spondylitis deformans, traumatic spondylitis, and other vertebral affections. The diagnosis of a lesion on a dry skeleton as the result of a certain disease is beset with uncertainties. At the most, ancient lesions can only be said to be strongly suggestive of certain pathologic processes. In only one case of the many assigned to Pott's disease in ancient times has it been possible to recover evidences which definitely identify the disease.

The five examples of spinal disease described herewith represent a wide range of time and space and indicate an antiquity for spinal deformations, which if we could find the material, would doubtless be as old as the human race itself and older, for we know of examples of spondylitis extending back among the dinosaurs to an antiquity of 25,000,000 years or more. The following tabulation gives the approximate time and locality of each example. They do not all represent Pott's disease, but are worthy of description in this connection:

1. Neolithic Heidelberg (Late Stone Age)—ascribed to Pott's disease by Bartels. Age: About 5000 B. C.

2. Ancient Egypt (XXIst Dynasty)—ascribed to Pott's disease by Smith and Ruffer. Age: 1000 B. C.

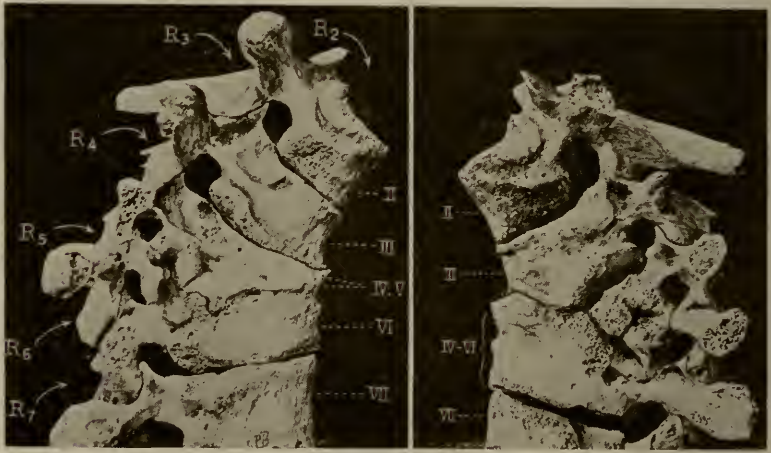

Fig. 200. Fig. 201.

Figs. 200, 201.—Right and left views of the upper dorsal vertebræ of a young man of the Neolithic period (5000 B. C.) found near Heidelberg and regarded by Bartels as indicative of the oldest case of Pott's disease. The symbols ("R2," etc.) refer to the costal articular facets. The Roman numerals indicate the position of the vertebræ in the thoracic series. The kyphosis is quite evident. (After Bartels.)

3. Merovingian Cemetery in Weimar—suggestive of Pott's disease in the Skoliosis sinistra by Pfeiffer—fourteen-year-old girl. Age: 500 B. C.

4. Pre-Columbian North American Indian—hypertrophic spondylitis and necrosis. Age: 1400 A. D. (?)

5. North American Indian (Pre-Columbian?)—Lumbar Necrosis—(tubercular?). Age doubtful (500 years old?).

The Neolithic skeleton, that of a young man about twenty or twenty-five, was found in a grave[1] of proved Neolithic age (3000 to 7000 B. C.) near Heidelberg. Portions of the entire skeleton were preserved, none of which presented important lesions except those of the upper thoracic series (Figs. 200–202), which show the lesions that have been interpreted as the oldest evidence of Pott's disease.

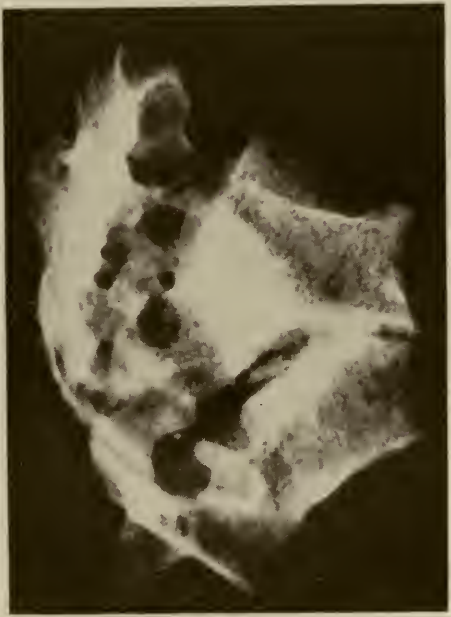

Fig. 202.—Radiograph of the necrotic area of above series. (After Bartels.)

The lesions involve especially the third, fourth, fifth, and sixth vertebræ. The necrotic processes have produced a right kyphoscoliosis, resulting in a decided bending toward the right, due to the lateral absorption or necrosis of an entire vertebral body, the fifth.

---

[1] In another Neolithic grave near L'Auméde, Pruniéres found an ankylosed talotibial joint, with a healed lesion of an old chronic ulcerated area, which had necrosed the lower end of the tibia. This has been regarded as an example of Neolithic articular tuberculosis.

A diagnosis of Pott's disease, made on such meager evidence, can only be accepted with hesitancy. It may be regarded as extremely suggestive, and we are entitled to say that vertebral tuberculosis is suggested by this discovery 7000 years ago.

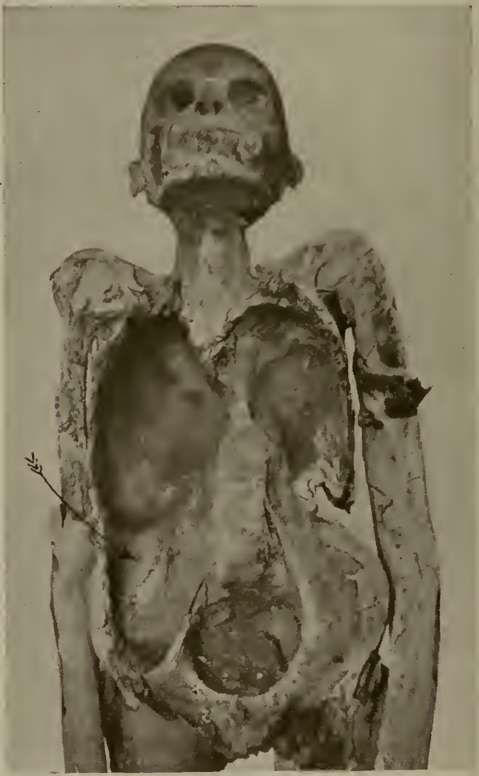

Fig. 203.—Mummy of the priest of Ammon, from an Egyptian cemetery of the XXIst Dynasty (1000 B. C.) showing at the point of the arrow a huge psoas abscess, due to tuberculous infection in the upper lumbar region. (After Smith and Ruffer.)

The earliest definite evidence of vertebral tuberculosis is that described by Elliot Smith and Ruffer in a mummy of a priest of Ammon from Ancient Egypt (XXIst Dynasty, 1000 B. C.), discovered near the ancient city of Thebes in 1891 by M. Grébaut and at present preserved in the anatomical museum of the medical school at Cairo.

The mummy (Fig. 203) is that of a young adult male, which shows, in the scoliosis of the lumbar region and especially in the huge psoas abscess of the right pelvis, the earliest definite indications of Pott's disease. The lesion in the third and fourth lumbar vertebræ is accompanied by hypertrophic processes and by necrosis of the bone.

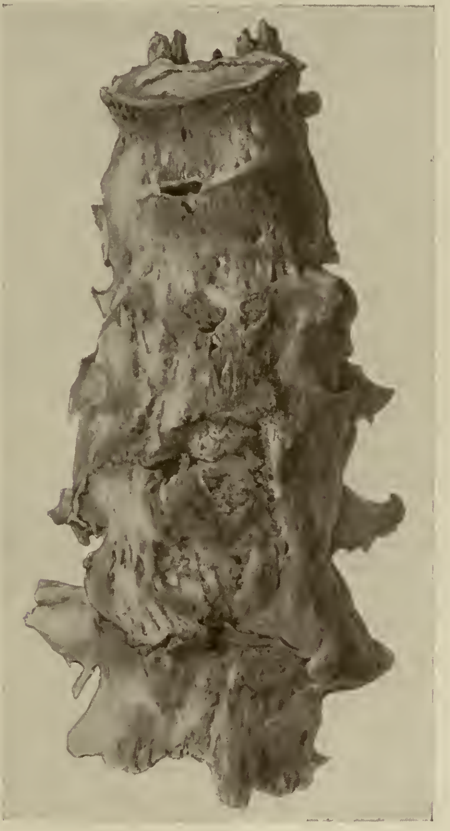

Fig. 204.—Diseased lumbar vertebræ of a North American Pre-Columbian Indian. Male. Found at Grand Gulch, Utah. The original is in the American Museum of Natural History.

On the right side, at the level of the first lumbar vertebra, is seen the beginning of a huge swelling, apparently a psoas abscess, which had destroyed all the muscle-fibers of the right psoas, though they are well preserved on the left side. The abscess, so common in Pott's disease today, must have had a capacity of several liters. The abscess was not ruptured during the embalming process, since the pitch and trash which filled the abdomen of the mummy was deeply embedded in its substance. This indicates that the abscess was still soft at the time of death.

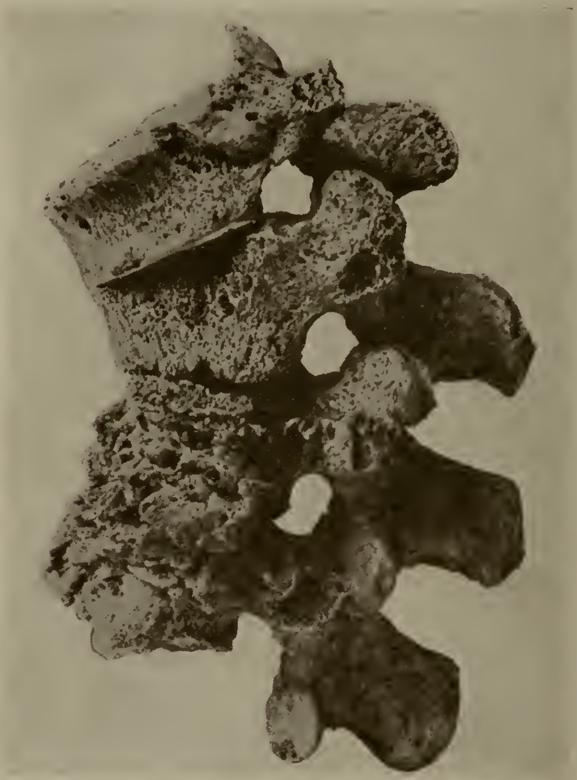

Fig. 205.—Diseased (tuberculous) lumbar vertebræ of an early (Pre-Columbian?) North American Indian from a mound in Northern Louisiana, suggesting Pott's disease. (After Hrdlicka.)

No bacteria of the type of the tubercle bacillus were found in the unpromising mummified material, although portions of the abscess were examined microscopically. The spores and mycelia found in the mass were doubtless introduced with the embalming materials.

The presence among the primitive North American Indians in Pre-Columbian times of a diseased condition of the spine resembling Pott's disease is indicated in only two instances.

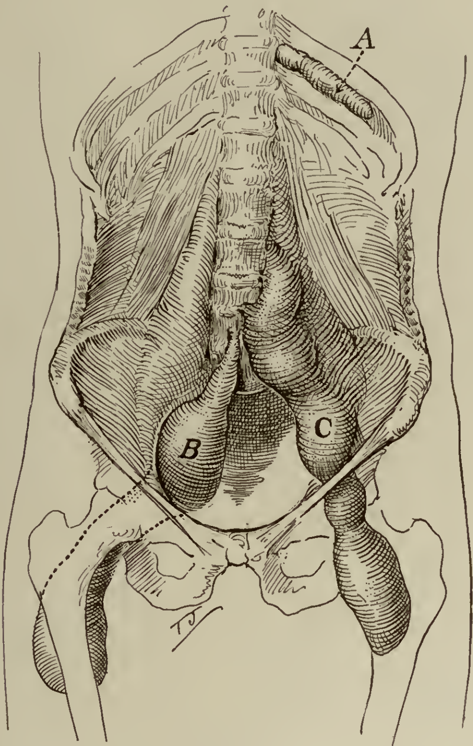

Fig. 206.—Diagram showing three types of abscesses due to vertebral tuberculosis: *A*, Intercostal or lower thoracic abscess similar to the case shown in Figs. 200 and 201. *B*, Lower lumbar abscess which passed out into the femoral region through the sciatic notch. *C*, A psoas abscess penetrating into Scarpa's triangle. (Modified from Testut and Jacob.)

The evidence is not definite enough to establish a diagnosis of vertebral tuberculosis, but is suggestive of this condition, as may be seen by reference to Figs. 204–206.

The specimen shown in Fig. 204 represents the five lumbar vertebræ of a male Pre-Columbian Indian found at Grand

Gulch, Utah. The original of this figure is the property of the American Museum of Natural History in New York City, and I am indebted to Dr. Sullivan, of that institution, for the privilege of studying it.

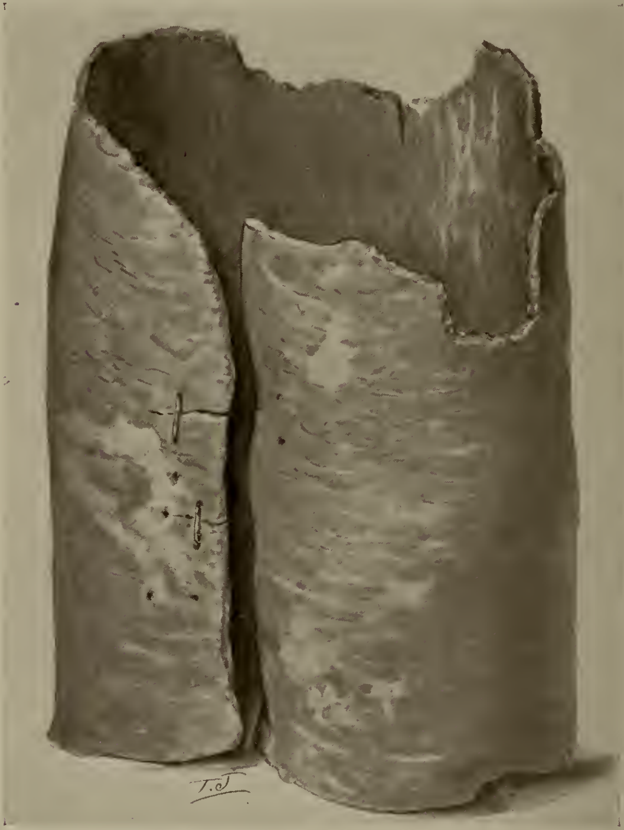

Fig. 207.—A bark (orthopedic?) corset doubtless used for treatment of spinal lesions and suggesting considerable knowledge of spinal disturbances. Used by the primitive Indians of western North America. (After Freeman.)

The specimen presents a moderate right scoliosis and considerable necrosis of the bone at the intervertebral region of the third and fourth vertebræ. Accompanying the necrosis, to which scoliosis is due, is an extensive hypertrophic spondylitis, differing in many respects from the *spondylitis deformans* so commonly seen among the ancient Egyptians. The neural spines and lateral processes of all the vertebræ are rugose and beset with spinous processes, indicating the presence of a rather intense inflammatory reaction.

The other specimen (Fig. 205) which suggests Pott's disease is that of a more recent Indian, described by Hrdlicka, from an early mound in northern Louisiana. There is a marked lordosis and the specimen is extensively necrotic, but there is no evidence to prove the presence of tuberculosis as the cause of the lesion.

There is very little evidence to prove that the primitive peoples of ancient times made any effort to treat lesions of the spine by surgical means. The idea of draining an abscess seems to have developed in relatively recent times. That the North American Indians, at least, attempted to aid spinal deformations is suggested by a corset made of bark and provided with eyelets (Fig. 207) for lacing, which is described and figured by Freeman. This corset suggests some knowledge of spinal diseases and indicates an attempt to aid in their cure.

CLINIC OF DR. GOLDER L. McWHORTER

PRESBYTERIAN HOSPITAL

CHONDROMA OF THE THUMB

Summary: Large tumor of the thumb developing six months after a single trauma. Diagnosis. Advisability of radical treatment. Amputation under procain anesthesia—technic. Etiology and pathology of chondromas.

THIS patient gives a history of having struck the end of his right thumb against a ladder about two years ago. There was considerable swelling of the metacarpophalangeal joint following the accident, but it did not prevent him from working. This swelling gradually went down, the motion becoming normal. There remained, however, quite a prominence on the inside and dorsum of the head of the first metacarpal. This remained unchanged until the patient struck this region of the thumb six months ago. Following this injury the prominence began to grow quite rapidly, and in a month was the size of an English walnut. This has continued to increase rapidly for the last six months.

The roentgenogram (Fig. 208) shows a tumor which is evidently largely cartilage. There are areas and radiating strands present which are calcified and perhaps ossified. The growth extends over the proximal phalanx and over nearly all of the metacarpal bone.

On physical examination the tumor is subcutaneous, the surface somewhat nodular, and on palpation the growth is quite hard throughout. There is absolutely no motion of the metacarpophalangeal joint, but the interphalangeal joint is normal and the movement of the tendons is not interfered with.

On account of the extensive growth of this tumor around the bones of the thumb a conservative operation is impossible.

Even though it were possible to do a resection, with the history of a rapid growth in such a tumor I would advise a carpometacarpal amputation. The chances are that if there have been sarcomatous changes, a more radical amputation will do no more in the prevention of a recurrence or metastases.

Technic of Amputation of Thumb at Carpometacarpal Joint.—I am using $\frac{1}{2}$ per cent. procain with 3 drops of a 1 : 1000 epinephrin solution to the ounce. The field has been prepared with two coats of tincture of iodin and surrounded with sterile towels.

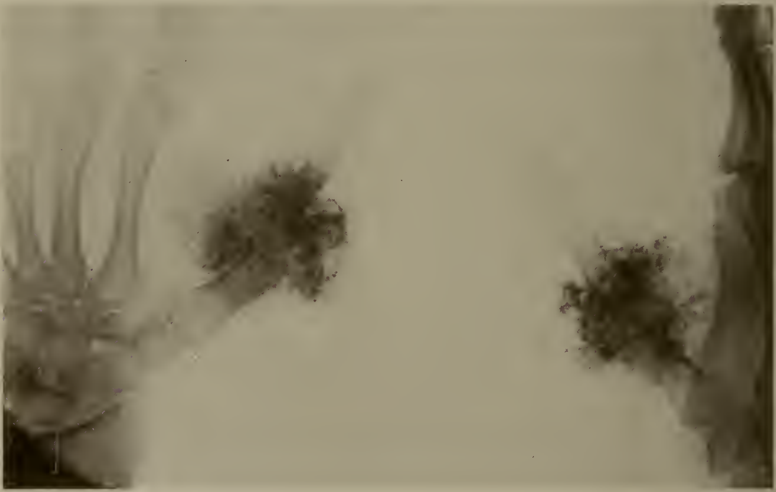

Fig. 208.—This roentgenogram shows areas of calcification or ossification in the tumor. These areas are quite large near the joint and obscure the outline of the phalanx and metacarpal bone.

I have an Esmarch constrictor placed around the arm so that it can be tightened if necessary. However, I prefer not to use it if I can catch the bleeders as I cut them.

The method of local anesthesia which I am using is a combination of nerve-blocking and infiltration. The sensory nerve-supply to the thumb comes from the median and the radial nerves. I first block these nerves at the wrist. It is unnecessary to encircle the wrist with the anesthesia, because the ulnar does not supply any sensory branches to the thumb. I extend the anesthesia to the median nerve anteriorly and block it by deep injections (Fig. 209). On the dorsal and lateral side of the wrist I anesthetize the sensory branches of the radial nerve and of the cutaneous antibrachii lateralis (Fig. 210). It takes at least ten minutes for the nerves to become completely blocked, and unless their sheaths are injected directly the anesthesia may be incomplete; therefore I am infiltrating around the thumb.

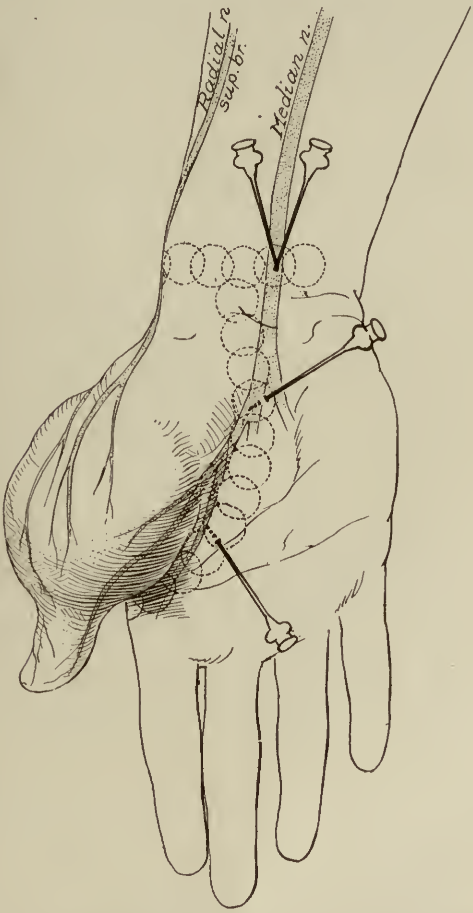

Fig. 209.—Sketch illustrating the method of blocking the sensory nerves to the thumb on the anterior aspect of the wrist, combined with infiltration around the thumb.

I now outline and cut the skin-flaps, making them about one-third longer than necessary to cover the raw surface. There are a few superficial bleeders which I am clamping. I dissect out the radial artery as it passes between the first and second metacarpals. The artery is easily seen, and I clamp and cut it without any bleeding. I cut the muscles and tendons at the base of the thumb, open the carpometacarpal joint, and free the metacarpal bone. With blunt dissection of the deep part of the

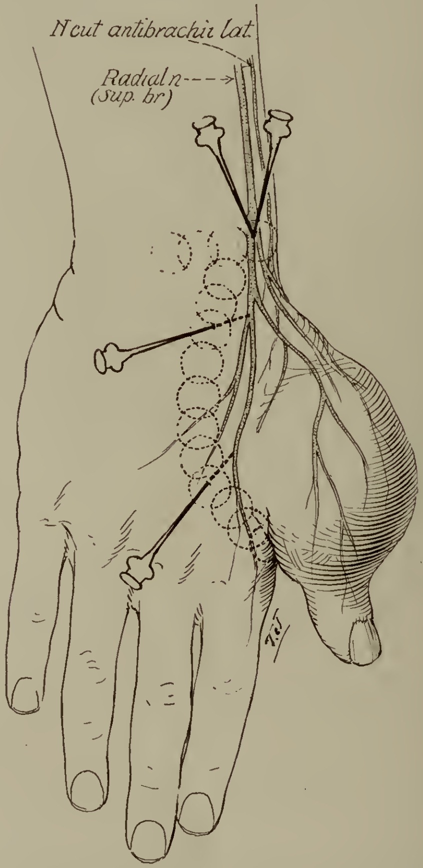

Fig. 210.—The dorsal sensory nerves are blocked at the wrist (compare Fig. 209).

tumor and by cutting the deeper muscles I separate the entire thumb and tumor from the hand. I am making no attempt to suture the tendons or ends of the muscles which are cut off short; there are a few bleeders to ligate. I will now close the skin without drainage, using interrupted silkworm-gut sutures and a few waxed linen sutures to approximate the edges carefully.

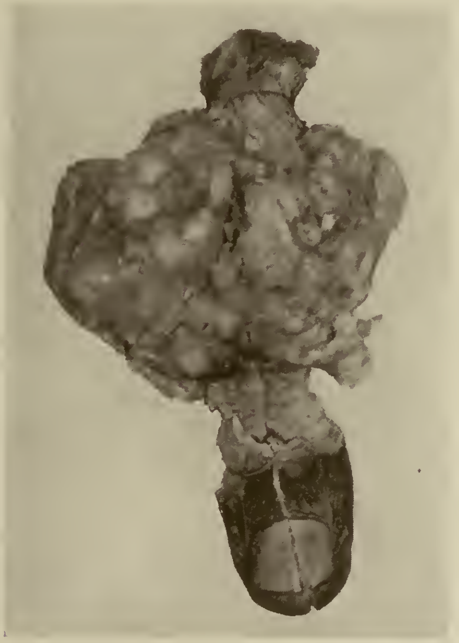

Fig. 211.—Specimen after removal. The skin and tendons lying superficially to the tumor have been removed. The lobules of the tumor are easily seen.

The tumor on examination is found to be 24 cm. in circumference and 5 cm. long (Fig. 211). It is covered only by the skin and the tendons which are pushed out and lie entirely superficial, although the latter form shallow grooves in places. The tumor is distinctly lobulated and at the periphery there are multiple lobules budding off from the larger ones. On longitudinal section through the phalanx and metacarpal bone the joint and the greater part of both bones are found to be entirely surrounded by the tumor (Fig. 212). This does not involve the medullary cavity. On both the metacarpal bone and the phalanx the cortex has been compressed in one place. The cortex, however, is largely intact, although near the joint, where it normally becomes thinner, it appears to be absent. There is no motion between the metacarpal and phalangeal bones. On examination this is seen to be due to the overgrowth of the tumor around the joint producing a subluxation and surrounding it like a cast. There is destruction of the joint cartilage only at the periphery of the joint due to pressure and ingrowth of the tumor. The periosteum may be dissected out in most places between the tumor and the

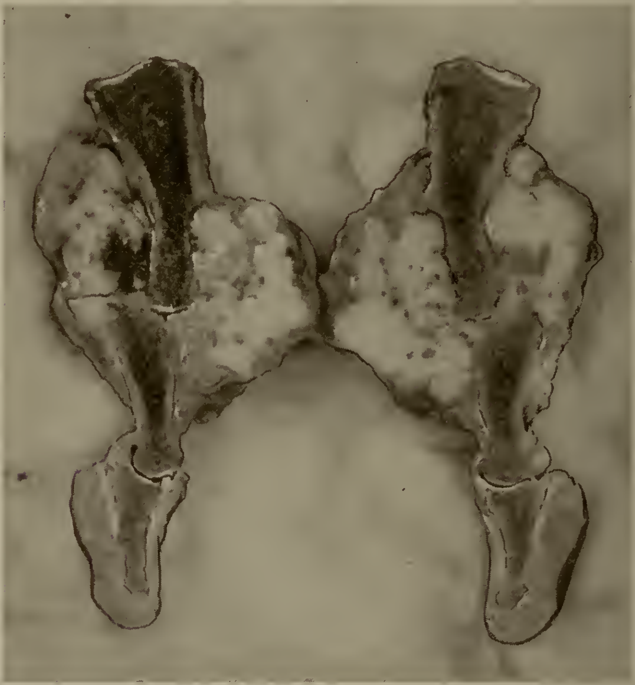

Fig. 212.—Specimen sectioned in sagittal plane (compare Fig. 211). The bones are seen to be incased by tumor as by a cast. A subluxation is present due to the tumor overgrowth at the joint.

cortex except near the joint. There are areas in the tumor which are evidently bone and others of calcification. These tend to run radially from the center. Many lobules also radiate from the center. Blood-vessels run between these lobules and occur in the region of the calcified and ossified areas. Two or three of the larger lobules are cystic, containing a clear fluid and their inner walls have a worm-eaten appearance.

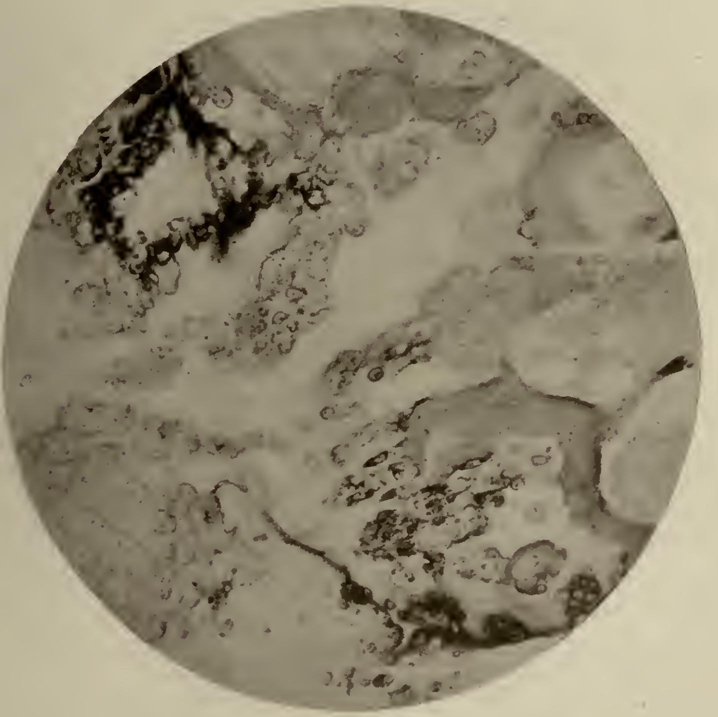

Fig. 213.—Photomicrograph. This section was cut from the tumor near the joint. It contains cartilage, areas of calcification, and bone trabeculæ.

On later microscopic examination the cartilage is found to be hyaline in structure. The arrangement of the cells is embryonic in many parts, but very irregular, with usually one or two cells in a lacuna. In some regions there is calcification of the intercellular substance. The cartilage cells in the region of ossification are swollen, irregular in size and arrangement in groups, and their intercellular substance appears to be absent. The bone trabeculæ appear to encroach and form small islands of these cartilage cells. The region of ossification is well supplied with blood-vessels. In places a part of the cartilage is undergoing change of structure, as evidenced by swollen cells, a tendency to grouping, a loss of intercellular substance, and a transition into bone (Fig. 213). The cartilage nearby retains its embryonal structure.

Postoperative Course.—The wound healed by primary union. The use of the hand was started in a few days, and the patient had normal use of the remainder of his hand at the end of three weeks.

Prognosis.—The fact that this tumor started to grow rapidly about six months ago after remaining a small nodule for one and a half years speaks for a very actively growing tumor. While the histologic appearance of the areas examined is benign, even if there is no sarcoma present in other areas, late metastases of pure chondromata may appear.

DISCUSSION

Tumors consisting largely of cartilage are called chondromata. These tumors have been subdivided by some writers into ecchondromata and enchondromata. Ecchondroma occurs as an overgrowth or tumor arising where cartilage is normally present and persistent. When there is a direct continuity of the growth with this cartilage Adami thinks it should not be classed as a true tumor, but as a local hypertrophy. It is difficult, both grossly and microscopically, at times to determine whether there is a connection between the growth and the parent matrix. Ecchondromata may arise from the cartilage of the ribs, larynx, trachea, intervertebral disks, and the epiphyseal cartilages. It is worthy of note that they never develop from the articular cartilages of joints.

Enchondromata, in contrast, are independent nodules or tumors. Their origin is in dispute. In general, it may be said that they develop in regions where normally there is supposed to be no cartilage. In bones they may grow from the marrow.

In the last condition they are at first surrounded by a shell of bone through which the growth later breaks. In regard to etiology, the following theories may be considered:

1. They may arise from other forms of connective tissue, especially fibrous tissue. Adami believes that in a glandular organ there is a metaplasia of connective-tissue cells, although the cause is unknown.

2. Embryonic rests of cartilage may persist in bones or they may be misplaced into the salivary glands, the skin, etc. Developmental rests may form the origin, as in cases of rachitis, where there is a preponderance of cartilage with irregular ossification.

3. Weber states that a history of trauma may be obtained in 50 per cent. of cases.

4. Inflammatory processes may have occurred previously in some cases.

5. Heredity is a factor, as many cases occur in the same family and also through several generations.

6. Defective closure of the branchial clefts may be a factor in enchondromata of the skin and neck.

7. MacCallum believes that chondromata may arise from the cells which are so readily capable of producing cartilage, and later form bone, as following fractures where the periosteum and endosteum may produce cartilage.

The most frequent locations for enchondromata are in the bones, where they are common in the phalanges and metacarpals of the hand, also near the ends of the femur, in the pelvis, shoulder-girdle, and maxillæ. In the soft parts they may occur in the salivary glands, testis, mamma, lung, fascia, and skin.

Chondromata may degenerate and be largely myxomatous or cystic. There may be calcification or true bone. Not uncommonly the tumor may undergo malignant change and any type of sarcoma cell may predominate. The metastases may then be wholly sarcoma cells without the cartilage.

J. E. McWhorter has transplanted a mammary chondro-osteosarcoma of a dog through three generations. Chondromata usually appear during childhood or early adult life, but may be congenital. They are frequently multiple. The size of chondromata is variable. Small chondromata are spheric, but as they grow they become irregular and lobulated. The larger ones may have areas of softening and contain cysts, or the cavities may open on the surface of the skin. The consistency is of a stony hardness unless degeneration is present. On section, they have a whitish or a somewhat translucent appearance. Chondromata receive their blood-supply from the surface. In the large tumors, however, there may be numerous vascular fibrous trabeculæ dividing the cartilage into a number of islands or lobes. The fibrous capsule carries the nutrient vessels. Their growth occurs largely at the periphery along the zone of perichondrium, although the deep cartilage cells may multiply actively.

The histology is variable, depending upon the type of cartilage, upon whether degeneration has occurred, whether calcification or ossification is taking place, and whether evidences of malignancy or mixed cells, as in mixed tumors of the salivary glands, are present.

The usual type of cartilage is hyaline in chondromata arising from bone, but elsewhere it may be elastic, fibrous, or a combination. There may be fibrous areas in the hyaline structure and also at the periphery where the cartilaginous structure merges into the fibrous investing membrane. The cells may be large, small, rounded, spindle shaped, or stellate. They may be abundant or scanty. The cartilage lacunæ may be various shaped and contain one or many cells of varying sizes. These spaces may fuse following proliferation of the cells and become large cavities or cysts. In chondrosarcoma there is a gradual transition from normal cartilage cells in the center to a more mucoid tissue, and finally at the periphery, true sarcoma cells. From the outer vascular sarcoma tissue there occur gradual transition and substitution of the avascular cartilage substance. This is evidence against the view that the growth is primarily sarcomatous (Adami). Various types of degeneration, mucoid, myxomatous, or lipoid, may occur with the formation of cysts, or perhaps ulceration through the skin and sepsis. Areas of calcification and ossification are common in the large tumors. The growth may become calcified (enchondroma petrificum) or ossified, especially in ecchondromata (ecchondrosis ossificans, Kaufmann).

It is often impossible to determine histologically whether metastases may occur or not, since in spite of a benign appearance of a chondroma it may recur or metastasize. These metastases may be pure chondroma as well as sarcoma, and are especially common in the lymph-glands, muscle, lung, and liver. Metastases of pure chondromata are explained by the observation of Virchow of ingrowth of cartilage into the veins. They may appear several years after removal or development of the chondroma.

CLINIC OF DR. EDWARD LOUIS MOORHEAD

MERCY HOSPITAL

ACUTE APPENDICITIS AND GALL-STONES

Summary: A patient presenting typical signs and symptoms of acute appendicitis. Appendectomy—the right rectus incision—value of abdominal exploration in these cases—discovery of condition of chronic cholecystitis with calculi in present case—cholecystectomy. Differential diagnosis of acute appendicitis.

THE patient, a married American woman of twenty-eight years, was admitted to the medical service yesterday, and gave the following history:

Two days previous to admission to the hospital she was seized with pains of a sharp, cramping character in the lower abdomen, on the right side. She had a chill, some fever, and vomited several times. Her bowels were constipated. She states that she had an attack similar in character about three months previously, and at that time a diagnosis of acute appendicitis was made and operation advised, but she would not consent.

She is the mother of 4 children. There is no history of miscarriage or abortions. Menstruations have been regular and not attended by any unusual discomfort or pain. There is no history of any previous illness.

The physical examination, as recorded on the medical service, showed the following: The patient is a fairly well-nourished woman. Head and neck are negative. A few râles are heard diffused over both lungs. Heart tones are normal and there are no murmurs. The abdomen shows some distention and tympanites, with marked rigidity in the right lower quadrant. Pain is present and increased upon the slightest pressure over the same area. The limbs are drawn up by the patient, apparently for relief of the pain. The general appearance of the patient is that of one acutely ill.

Urinalysis shows specific gravity 1028; acid reaction; trace of albumin; some white blood-cells; no red blood-cells; few epithelial cells.

Blood examination shows leukocytes, 9250; erythrocytes, 5,150,000; hemoglobin, 85 per cent.

Pulse is 120; temperature, 101.2° F.; respirations, 28.

She was transferred to the Surgical Service for operation, with the diagnosis of acute appendicitis.

The patient has received the usual preliminary preparation, and now that she is fully anesthetized we will proceed with the operation. In these cases, especially in the female, I prefer to make use of the right rectus incision, only that it is extended a little higher up than is the custom. Through this incision one is able not only to remove the appendix but also to examine the gall-bladder above and the uterine appendages below, and if a more extensive operation is demanded, the incision may be extended in either direction as required.

Upon opening the peritoneum the omentum is found to be adherent low down on the right side, giving evidence of the existence of an acute inflammatory process. The omentum is gently separated from the underlying bowel, exposing an acutely inflamed appendix. The appendix is freed from its adhesions and delivered with the cecum. Two laparotomy pads are now placed over the wound to protect the abdomen. The meso-appendix is ligated and cut. A purse-string suture is passed around the base of the appendix. The appendix is now ligated and amputated. The stump is treated with carbolic acid and alcohol, then inverted, and the purse-string suture tied. The cecum is returned and the omentum drawn down. Before finishing operations of this character it is always advisable to examine the gall-bladder. Passing my fingers upward, they come in contact with the gall-bladder, and I find it to be full of stones. This condition will necessitate extending the incision a little higher in order that the condition of the gall-bladder may be cared for. Of course, it would be quite improper to allow this condition of the gall-bladder to go unattended and close the operative wound at this stage. The association of gall-bladder disease and inflammations of the vermiform appendix is of frequent occurrence, and I want again to emphasize the value of the high rectus incision as made in this case, because of the opportunity it gives to meet with added conditions that may be found within the abdomen at the time of operation.

The gall-bladder is freed from some adhesions, the evidence of pericholecystitis. Apparently there is very little fluid in the gall-bladder. In view of the fact that an acutely inflamed appendix has been removed, it will be preferable to drain this gall-bladder after the removal of the stones. Accordingly, the fundus of the gall-bladder is picked up with two tissue forceps and incised. There escapes some thick glossy mucus, evidence of a chronic inflammatory condition, and nine stones are found free in its cavity. The stones are each about $\frac{3}{8}$ inch in diameter. They are easily removed, but very little bile is present. There remains one stone low down in the cystic duct. It seems that I am unable to dislodge it, and, therefore, it will be necessary to remove the gall-bladder. Had we known that this last stone was so firmly lodged in the cystic duct the gall-bladder would have been removed without having first opened it. However, the stones were so intimately packed together that this could not be determined.

A clamp is now applied to the open end of the gall-bladder, thus closing it. The cystic duct below the impacted stone is isolated, clamped, ligated, and cut. The cystic artery will be ligated separately. The peritoneal attachment of the gall-bladder to the liver is divided and closed with a continuous suture of catgut. A rubber drainage-tube is placed down to the point of severance of the cystic duct. This drainage-tube is not anchored in the bottom of the wound, but is attached to the skin incision. The reason for this is that the tube will in all probability be removed in forty-eight to seventy-two hours. In some of these cases there will be free drainage during the first twenty-four to forty-eight hours and, hence, the necessity of having the tube in place. After completing the toilet of the peritoneum, the abdominal wound is closed layer by layer in the usual manner. The drainage-tube is anchored to the skin in the upper angle of the wound. The usual dressings are applied.

This case teaches a lesson always to examine the gall-bladder, if possible, during operations on the vermiform appendix. If it were not for the fact that we found at this operation an acutely inflamed appendix, the pathology of which there can be no doubt, one would be inclined to believe that there was an error in diagnosis. However, in this present case we are confident that no error has occurred, but that the case was one of acute appendicitis associated with a chronic gall-bladder disease. Many of you here present, no doubt can remember having seen at times cases where the appendix has been removed with no apparent pathology present in it, and yet where the operating surgeon may have been given a typical history such as this case presents. Never be satisfied where you do not find sufficient pathology in the appendix until you have explored the other abdominal viscera, such as the gall-bladder, kidney, and uterine appendages. Occasionally a patient presents himself to the surgeon with a history of having been operated upon for appendicitis, and yet complains of the same symptoms he had previous to the operation. What is the explanation? Either faulty technic at operation, with resultant adhesions, or an error in preoperative diagnosis, probably due to a failure to obtain a proper history and the making of a satisfactory examination and analysis of the case. In a typical case of appendicitis if the patient is kept under observation for a few hours or a day, the signs and symptoms are so distinctive that an error in diagnosis is not likely to be made.

Sudden perforations of the gastro-intestinal tract from other causes than appendicitis, as ulcer of the stomach, the duodenum, or a typhoid ulcer, may closely simulate acute perforative appendicitis, but in these cases much will depend upon our knowledge of the previous history of the case and our ability to locate the origin of the process in the right iliac fossa. In the early days of typhoid fever without perforation an error is quite possible; localized pain and tenderness in the right iliac fossa, vomiting, and fever are all present in certain cases. Widal's reaction may be negative. In these cases leukocytosis characteristic of suppuration and an increased pulse-rate may aid in the diagnosis of appendicitis.

In affections of the gall-bladder reliance must be placed upon a history of repeated attacks of gall-bladder pains, the pains radiating around the waistline and under the right scapula. Jaundice may occur, there will be signs of intraperitoneal irritation, and the pain, tenderness, and rigidity will be at a higher point than in appendicitis. Sometimes the gall-bladder is palpable. In women it is often difficult, sometimes impossible, to differentiate between disease of the right tube and ovary and appendicitis. This is especially true because an inflamed appendix often becomes adherent to the tube and ovary, or, on the other hand, an inflamed tube or ovary may become adherent to and involve the appendix. A complete previous history combined with a careful abdominal and vaginal examination will aid in clearing up the diagnosis. Fortunately, both these conditions may be reached with comparative ease through the right rectus incision as used in this case.

Movable kidney, renal calculus, and ureteral calculus have all been mistaken for appendicitis. Movable kidney is usually found in neurasthenics and women suffering from general enteroptosis. The pain accompanying renal colic is often attended by vomiting and prostration. If the stone is in the pelvis of the right kidney or in the right ureter, the condition may closely resemble appendicitis. Absence of fever and leukocytosis, of tenderness and rigidity in the right iliac fossa, and especially the sudden cessation of pain common in renal colic, will usually suffice after a few hours to make the differential diagnosis.

In children the occurrence of blood in the stools is the most distinctive difference between intussusception and appendicitis. The sausage-shaped tumor of the former is movable and is not especially tender. The pain of intussusception is very intense, but is usually intermittent or remittent; the pain of appendicitis is continuous.

Inflamed retroperitoneal lymph-nodes in the right iliac fossa may simulate appendicitis. Vomiting is usually absent. Pain, if present, is of a dull character. A palpable tender tumor, sometimes with marked septic symptoms, may be present. The acute onset characteristic of appendicitis, however, is absent.

TWO CASES OF ACUTE LYMPHANGITIS

Summary: Severe systemic acute lymphangitis—the signs and symptoms. Anatomy of lymphatics of upper extremity. Demonstration of two cases of lymphangitis following slight injury of the hand. Treatment—rest and hot dressings; incision usually contraindicated.

THE two cases which are presented for examination this morning illustrate that type of lymphangitis which is designated as "severe systemic acute lymphangitis." In this type the infecting organism is, for the time being, of great virulence. These cases are characterized by alarming systemic symptoms, often associated with a trivial local manifestation. There is usually a chill, a decided elevation of temperature, the patient is prostrated, and presents a picture of severe systemic poisoning. The patient may react favorably after a few days or weeks of intense sepsis, and recover, or may succumb to an intense bacteriemia, septicemia, or pyemia.

The lymphatics of the upper extremity may be divided into two sets, superficial and deep. The superficial lymphatic glands are few in number and of small size. There are usually two or three in front of the elbow, and one or two above the internal condyle of the humerus near the basilic vein. The deep lymphatic glands are also few in number. A few small ones are usually found in the course of the radial and ulnar vessels in the forearm; and in the arm there is a chain of small glands along the inner side of the brachial artery. The axillary glands are of large size. A chain of these glands surrounds the axillary vessels embedded in a quantity of loose areolar tissue; they receive the lymphatic vessels from the arm; others are dispersed in the areolar tissue of the axilla; the remainder are arranged in two series, a small chain running along the lower border of the pectoralis major as far as the mammary gland, receiving the lymphatics from the front of the chest and mamma; and the others are placed along the lower margin of the posterior wall of the axilla, which receive the lymphatics from the integument of the back. Two or three subclavian lymphatic glands are placed immediately beneath the clavicle; it is through these that the axillary and deep cervical glands communicate with each other. In malignant diseases, tumors, or other affections implicating the upper part of the back and shoulder, the front of the chest and mamma, the upper part of the front and side of the abdomen, or the hand, forearm, and arm, the axillary glands are liable to be found enlarged. It is of great importance, therefore, that they be carefully examined, for in operating for these conditions it is quite essential that these glands be removed. The superficial lymphatics of the upper extremity commence in the fingers, two vessels running along each side of each finger, one on the palmer and the other on the dorsal surface. Those on the palmar surface form an arch in the palm of the hand from which are derived two sets of vessels, which pass up the forearm, taking the course of the subcutaneous veins. The lymphatics from the dorsal surface of the fingers form a plexus on the back of the hand and, winding around the inner and outer borders of the forearm, unite with those in front. Those from the inner border of the hand accompany the ulnar veins along the inner side of the forearm to the bend of the elbow, where they join with some lymphatics from the outer side of the forearm; they then follow the course of the basilic vein, communicate with the glands immediately above the elbow, and terminate in the axillary glands, joining with the deep lymphatics. The superficial lymphatics from the outer and back part of the hand accompany the radial veins to the bend of the elbow, the larger part of them here joining with the basilic group, and the remainder ascend with the cephalic vein on the outer side of the arm, some crossing the upper part of the biceps obliquely, to terminate in the axillary glands, while one or two accompany the cephalic vein in the cellular interval between the pectoralis major and deltoid and enter the subclavian lymphatic glands (Fig. 214).

The deep lymphatics of the upper extremity accompany the deep blood-vessels. In the forearm they consist of four sets, corresponding with the radial, ulnar, and interosseous arteries;

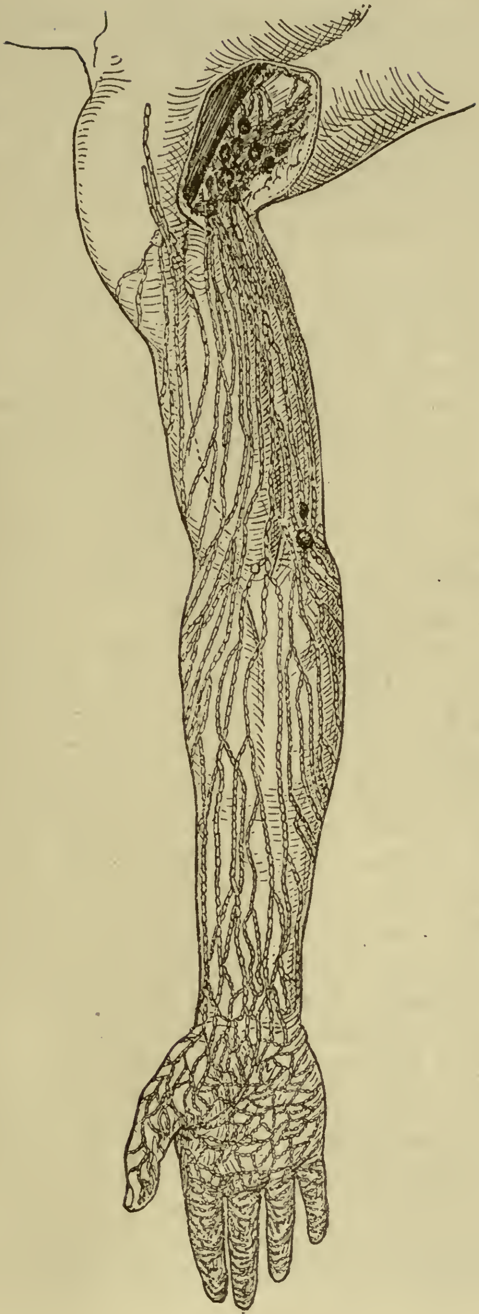

Fig. 214.—Sketch illustrating distribution of superficial lymphatics of upper extremity.

they pass through the glands occasionally found in the course of these vessels, and communicate at intervals with the superficial lymphatics. In their course upward some of them pass through the glands which lie upon the brachial artery; they then enter the axillary and subclavian glands, and at the root of the neck terminate on the left side in the thoracic duct, and on the right side in the right lymphatic duct.

Our first patient, Mr. J. M., is a railroad conductor, fifty-two years of age, and married. He gives the following history:

Five days ago while engaged in his work as a passenger conductor it became necessary for him to unfasten a bunch of tickets. In doing this the palm of his left hand was scratched by the wire which bound the packet. The wound bled a little. He applied tincture of iodin and covered the wound with a gauze dressing. The accident occurred about noon time. His train arrived in the city at 10 P. M. and he went directly to his home and retired. During the night he had a severe chill and suffered great pain in the hand and arm.

I saw him at 9 o'clock the next morning, about twenty hours after the receipt of the injury. At that time the pulse was 120, temperature 103° F., respirations 24. There was very little swelling of the hand or arm. On the palm of the left hand there was a scratch about $\frac{3}{4}$ inch in length. It apparently was not very deep. Extending upward on the anterior surface of the forearm and arm there were three or four red streaks. These were extremely tender on pressure. There was a great deal of pain, especially at the bend of the elbow and in the axilla, where the glands were palpable. The leukocyte count at this time was 8500. Urinalysis showed a specific gravity of 1030; acid reaction; trace of albumin; no sugar; no casts.

The patient was immediately given 1500 units of antitetanic serum, and a warm, moist dressing enveloping the hand, forearm, arm, and axilla was applied. These dressings were changed frequently enough so as always to be warm and moist.

It is now five days since the injury was received. You can still see the red streaks marking the course of the lymphatic vessels, although their color has faded considerably. There have been no areas of fluctuation and no incisions have been made. The tenderness and pain which were so marked in the early stages of the disease have greatly diminished. The temperature has shown a gradual decline and is now practically normal. The dressings will be continued for a few days until all signs of infection have disappeared. The patient states that he feels much better and can move the hand and arm without discomfort.

The second patient, M. G. F., is an Austrian, twenty-three years of age. He is single and a clerk by occupation. He gives a history of having received a stab wound in the middle finger of the right hand ten days ago. The wound, which was made with a pocket knife, is about ½ inch long and ⅛ inch deep, going through the skin and subcutaneous tissue. He states that iodin and a gauze dressing were applied. There was no special pain or discomfort in the hand following the injury. Three days later he fell down a stairway and in trying to save himself his hand struck the railing of the stairway. This caused the wound of the finger to bleed profusely and a physician who attended him sutured the wound to control the hemorrhage. The following day the hand and forearm became painful and slightly swollen. Red streaks appeared in the forearm and arm, and the pain became marked at the elbow and in the axilla. He says that he had a chill, followed by fever, and that he felt very sick. On the second day following the suture of the wound he was admitted to the hospital.

On entrance to the hospital (five days ago) his temperature was 102.5° F. and pulse 120. The hand, forearm, and arm were swollen, and the red streaks extending from the hand upward to the axilla were quite pronounced. There was tenderness all along the lymphatics and especially at the elbow and in the axilla, where the glands were palpable. The sutures were removed from the wound and a warm moist dressing enveloping the hand, forearm, arm, and axilla applied. The dressings were changed frequently enough so as always to be warm and moist.

At the present time the glands at the elbow and in the axilla are palpable, but they are smaller and not as painful as they were.

The red streaks along the forearm and arm are still visible, but their color has faded considerably. There have been no localized areas of fluctuation and no incisions have been made. The patient is making satisfactory progress. The temperature is 99° F. and pulse 80. The dressings will be continued until all signs of infection have disappeared. A question in this case may be: When did infection occur, primarily, at the time of injury, or later, at the time the wound was sutured?

The infecting organism in these cases is usually the streptococcus, commonly a hemolytic strain. The Staphylococcus aureus is found occasionally. The infecting organism usually gains entrance through a trivial wound, such as a prick or abrasion. The reaction rarely goes to pus formation. Cellulitis, with abscess formation and lymphangitis, each present a sharply distinct type of infection. They are associated only in a small proportion of the cases going on to pus formation. The local lesion is rarely more than a blushed area, possibly a slight blister, often so trivial as to pass unnoticed. As compared with cellulitis, the reddening from lymphangitis is of a brighter hue, fading off gradually into the normal; the tissue is not so tensely distended, nor is it so exquisitely tender to pressure as when pus is present. In the larger channels, the straight, bright red, and slightly raised and tender streaks are characteristic, converging into the epitrochlear region and into the axilla. The general intoxication is usually greater than with localized cellulitis. When the lymphangitis does go on to suppuration, this more commonly occurs where the vessels are least supported and lymph most readily pockets, as in the web space, the dorsum of the hand, and at the valves along the trunks through the forearm.

The treatment of these cases is based upon the diagnosis. If the inflammation is suppurative, drainage should be promptly instituted. On the other hand, if the inflammation is pure lymphangitis, and incision is made before a localizing process has been well walled off, incision is fraught with danger. It is found clinically that incision into the local site of invasion, or deeply across the lymph-channels or into the tender lymph-glands, is followed by a violent increase in constitutional toxemia.

In refraining from incision one is guided by the character of the lymphatic inflammation, the bright coloration, the light character of the throbbing pain, and the absence of the acute or exquisite deep tenderness which chiefly characterizes the early presence of pus. Good surgical judgment is required to refrain, on the one hand, from incising these violently septic cases, and, on the other hand, to avoid unnecessary delay in draining deep collections of pus.

The local treatment consists in putting the part to rest, elevating the extremity, and the application of warm moist dressings enveloping the hand, forearm, arm, and axilla.

The general treatment consists of rest, abundance of fluids, mild catharsis, and general supporting measures. As a rule, in all wounds of the hands or feet an injection of 1500 units of antitetanic serum is given, especially if the patient is seen soon after the wound has been received. If one elects to direct systemic measures specifically against the infecting organism, streptococcic antitoxin may be given.

CLINIC OF DR. FREDERICK HOWARD FALLS

COOK COUNTY HOSPITAL

RUPTURED INTERSTITIAL ECTOPIC PREGNANCY[1]

Summary: Examination and probable diagnosis. Operation—surgical pathology disclosed. Postoperative treatment. Discussion of general knowledge of cases of this type.

IN my discussion of the subject of ectopic pregnancy this morning I am showing a patient which some of you saw me operate on a few weeks ago. It is a case of interstitial ectopic pregnancy. I have the specimen removed here for your inspection.

Interstitial ectopic pregnancy is a relatively rare condition. According to Wynne, there have been 85 cases reported up to 1918 that can be considered authentic.

The condition occurs in about 1.16 per cent. of all cases of ectopic pregnancy. All causes which operate to induce ectopic pregnancy in other portions of the tube, such as inflammations, tumors, diverticulæ, malformations, etc., may operate in the case of interstitial ectopic pregnancy. Two cases have been reported following removal of tube and ovary on the affected side.

This patient entered the hospital on May 14, 1918, with the following history:

She is twenty-eight years of age, a housewife, and a native American. On December 13, 1917 she had her last regular menstrual period, which was normal in time, duration, and amount. On missing the next regular period she considered herself normally pregnant and experienced no unusual signs or symptoms until the latter part of March, when she began to feel fetal movements, and noticed that, unlike the sensations experienced in previous pregnancies, these movements were confined entirely to the left side.

---

[1] From the Departments of Obstetrics and Pathology, University of Illinois College of Medicine, Chicago, Illinois.

Three weeks before entering the hospital the patient arose one morning early to go to the bathroom. She was suddenly seized with a severe pain in the left lower quadrant of the abdomen—and promptly fainted. She recovered consciousness in a short time, summoned help, and returned to bed. Bleeding from the vagina began at the same time and was associated with the passage of clots and colicky pains in the lower abdomen. She was sure she had not passed a fetus. She had fainting spells every day for the next three weeks. During this time the patient felt very weak and for the week preceding entry into the hospital had been nauseated and vomited a greenish-yellow material. The bowel was constipated and she passed a great deal of gas. Insomnia and restlessness were pronounced. She was under the care of a physician who, because he was unable to make a satisfactory diagnosis, advised her to come to the hospital.

Menstrual and Marital History.—Menses began at seventeen; were regular and of the twenty-eight-day type, lasting six to eight days. She had menorrhagia, but no dysmenorrhea. Married October 9, 1909, and has 2 living children, aged six and five years. One miscarriage, spontaneous, four years ago. Has had leukorrhea for past six years following the first pregnancy.

Past History.—No other diseases except occasional tonsillitis. Acute articular rheumatism in 1910.

Habits.—No alcoholics, no drugs. Uses coffee to excess. Does her own housework.

Physical Examination.—Made on entrance by the house physician.

Head.—Ears and nose negative. Pupils react to light and accommodation. Some carious teeth—two teeth missing; some pyorrhea, otherwise O. K.

Neck.—No rigidity, adenopathy, deformity, or retraction. No venous pulsation.

Thorax.—Normal contour—breasts good size, but show no milk or colostrum on pressure. Expansion good. Lung excursion O. K. No areas of dulness or bronchial breathing.

Heart.—Apex-beat palpable in fifth left interspace in midclavicular line. Upper, left, and right borders normal position. First sound somewhat roughened. Rhythm regular—rate rapid. Accentuated second aortic and pulmonic.

Abdomen.—Liver and spleen not palpable. Tenderness bilateral between the anterior superior spines and navel. Uterus two fingers above the navel. No heart tones heard.

Vaginal.—Cervix not dilated. Many pea-sized growths over external lips. Moderate bilateral tenderness. Bloody discharge—no odor.

Extremities.—Upper and lower negative. No edema. Knee-jerks present and equal.

The patient was running a temperature of 101.6° F., pulse of 112, and appeared pale and toxic. The probable diagnosis of incomplete septic abortion was made, and the patient was treated according to the routine for such cases on our service, namely, tonic doses of ergot and hydrastis, ♍xx of each, t. i. d. The patient was placed in the semi-Fowler position, an ice-bag placed over the fundus, and fluids forced per os if stomach will tolerate. Otherwise fluid is given by continuous drop per rectum. Under this régime the temperature and bleeding subsided, and the abdominal pain, which had been quite severe at first, was considerably relieved. However, her general condition failed to improve satisfactorily, and I examined the case to confirm the diagnosis.

Physical Examination.—In general, the findings conform to those previously noted. Patient still has continuous left-sided pain and seems in rather poor condition. Bimanual examination reveals a large tender mass occupying the whole left lower quadrant of the abdomen reaching up to the umbilicus in the midline. Cervix is slightly softened and not patulous. The history of pain and fainting and irregular bleeding in a woman supposedly pregnant together with the finding of a large mass to one side of the uterus and filling up the vagina and culdesac make the diagnosis of ectopic pregnancy quite probable.

Because of these findings and probable diagnosis an immediate laparotomy was advised and the operation was performed the next day.

Operation and Surgical Pathology.—The usual midline incision below the umbilicus was made under ether anesthesia. On reaching the peritoneum it was found everywhere adherent to structures underneath, and required great care in opening to avoid wounding the small bowel, which, together with omentum, was plastered over a large mass completely filling the pelvis and half-filling the abdominal cavity, especially on the left side. The adhesions present were very dense and extensive, and consisted of masses of semi-organized clotted blood enclosing loops of bowel and omentum. On separating these adhesions on the left side, thick pus welled up from a cavity to the left of and slightly above the umbilicus. This was packed off by "lap." pads, and we proceeded to free the pelvic contents. On freeing the omentum and bowel severe hemorrhage was encountered from the dense adhesions and was controlled by hot packs. With considerable difficulty the uterus was separated from pelvic adhesions and brought up. The left cornua was greatly hypertrophied and appeared like a crater filled with large masses of coagulated and organized blood-clots to some of which placental tissue was adherent. These were removed in part, and because of the marked laceration of uterine musculature it was decided to resect the whole of the hypertrophied left horn. Accordingly, about two-thirds of the body of the uterus was removed, the amputation stump sewed over and dropped back. This procedure was elected instead of complete hysterectomy for two reasons: First, the patient had lost so much blood before the operation and during the breaking up of adhesions that she was in poor condition, and so the quickest and least extensive operation was called for. Second, the operation had to be done in the presence of pus, and therefore the limitation of the operative field was highly desirable.

On completion of the pelvic work the sac on the left side of the abdomen just above the umbilicus was opened more widely and a large amount of thick creamy pus was evacuated. The partially digested fetus could be felt within the cavity and was removed. Cigarette drains were then placed in the pus cavity in which the fetus had lain, and also down into the culdesac of the pelvis, and the abdomen was closed in the usual manner (Fig. 215).

The patient was in poor condition during the latter part of the operation, and 30 minims of camphorated oil and 1000 c.c. of normal saline solution were given hypodermically during the operation. This we have found to be of great benefit in hemorrhage cases, especially ectopic pregnancy and placenta prævia cases. Replacing the body fluids as soon after the hemorrhage as possible, providing you have the bleeding point secured, is very important.

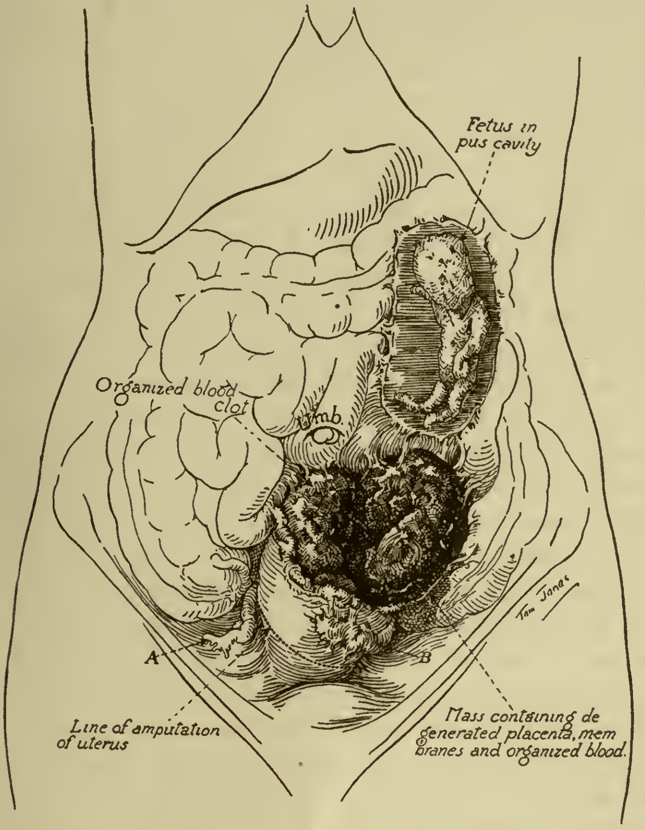
Fetus in pus cavity
Organized blood clot
Umb.
A
B
Tom Jones
Line of amputation of uterus
Mass containing degenerated placenta, membranes and organized blood.

Fig. 215.—Sketch illustrating condition found at operation.

She was placed in hot blankets and the semi-Fowler position was used as soon as she regained consciousness. Her condition was very poor for the next forty-eight hours, during which she received 3 per cent. glucose and 2 per cent. sodium bicarbonate solution per rectum by the continuous drop method. Caffein soda benzoate, gr. ij, was given hypodermically, and small doses of morphin to control restlessness and pain. There was a profuse discharge of foul-smelling pus from the incision, and examination showed colon bacillus and Staphylococcus aureus. By the end of the first week her temperature was nearly normal, as it is today. The discharge has been profuse, as you see it still is. Her general condition has improved greatly. She is eating full diet, and her appetite is getting better under a bitter hematonic. There is no bowel or bladder disturbance.

Pathologic Specimens.—The uterus specimen is, as you see, about two-thirds of a five-month-pregnant uterus. Note the fact that the tube runs over the swollen cornua of the uterus and that it is not distended itself. The round ligament also shows the usual relation to the uterine cornua, outside the gestation sac, facts that are necessary criteria for the diagnosis of the condition from the pathologic specimen. The rupture is on the posterior superior surface and remains of the blood-clots are seen in the cavity left after rupture and extrusion of the fetus. Notice that the placenta is badly distorted and has undergone degenerative changes. The fetus, as you see, is partially digested, probably largely due to the action of the ferments set free by the disintegrating leukocytes of the pus which surrounded it in the abdominal cavity. This is not necessarily so, however, as I have seen in some experimental abdominal pregnancies in dogs well over half-term an almost complete absorption of the fetus, even including parts of the bony skeleton, and no evidence of free pus in the abdominal cavity.

Discussion.—The etiology of this type of ectopic pregnancy is doubtless the same as for other types of ectopic pregnancy. It has been suggested that interstitial ectopic pregnancy should be more common than the other types because the lumen of the tube is narrower in this region. However, there are fewer folds of mucosa in this portion of the tube and less opportunity for bands of adhesions or extratubal tumors to cause distortion of the tube. Fränkel considers the presence of diverticula of the tubes in this region to be important predisposing causes. In this case the history of leukorrhea ever since the birth of the first baby probably is significant of an inflammatory change in the generative tract that might have resulted in the abortion which occurred four years ago, and the inflammatory reaction in the tubal mucosa which arrested the ovum in the interstitial portion of the uterus.

Cases of this type of ectopic pregnancy all have a bad prognosis. Prior to 1893 all cases had been found at autopsy. The mortality is 11.9 per cent. in a series of 82 operated cases.

It is interesting to note the time elapsing between the rupture and the operation—five weeks. This is unusual, although a few such cases are on record. It increases the danger from sepsis, which is almost bound to occur, as it probably did in this case, from invasion of the extravasated blood-clots by bacteria from the bowel wall or from an ascending infection from the vagina through the torn uterus. The latter avenue of infection is apt to be overlooked, but should be kept in mind and every precaution taken to guard against contamination of the vagina when making diagnostic vaginal manipulations. The danger of secondary hemorrhage from adhesions is much greater in these cases. On the other hand, it is undoubtedly true that in this case a certain amount of recuperation from the original hemorrhage had taken place.

Operation as soon as the diagnosis is made is the treatment of choice if the patient is not moribund from shock and hemorrhage. Speed is important and the abdominal route undoubtedly the best. The type of operation selected depends on conditions found. Hysterectomy, partial or complete, is the operation of choice in advanced cases. Excision of the sac with suture of the cornua is advisable in the earlier months. Normal saline solution given under the skin during the operation is a valuable adjunct in combating shock and hemorrhage.

0

RD
1
S85
v.4
no. 1-3

The Surgical clinics of
Chicago

Biological
& Medical
Serials

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY